ARCHIVES OF OTOLOGY.

A CASE OF EXTENSIVE CARIES AND CHOLESTEATOMA OF THE MASTOID PROCESS WITHOUT LOCAL SIGNS OF INFLAMMATION. DEATH FROM THROMBOSIS OF THE LATERAL SINUS AND MENINGITIS.

By Dr. HARRY FRIEDENWALD, of Baltimore.

(*With two drawings.*)

A FEW years ago Prof. H. Knapp,[1] of New York, published a remarkably interesting and instructive case of severe mastoid disease, secondary to otitis media and giving rise to distant abscesses over the occipital bone, in which he was unable to detect any signs of mastoid disease before the post-mortem examination revealed them. Death resulted from cerebellar abscess. Knapp points out the fact that "in this case, as in most others, the chief focus of the formation of pus was the mastoid cavity," and he uses the experience of this case as an argument for the wider extension of the indications for the artificial opening of the mastoid process. F. Tilden Brown[2] at the same time reported "a case of abscess of the mastoid with entire absence of tenderness, heat, or swelling over the suppurating part, with a constant distant pain near the occipital protuberance," in which recovery followed trephining of the mastoid process and the evacuation of the pus. Cases like these induced Gruber to consider such conditions as indicating the necessity for opening the process, in which "great pain came on in the course of suppurating ear troubles, pain in the side of the head corresponding with the affected ear, and uncontrollable by other means—even when no inflammatory signs

[1] Archives of Otology, vol. xii., p. 44.
[2] *Ibid*, p. 56.

could be found in the mastoid region." Other authorities are scarcely as decided, and there is by no means an agreement regarding this subject. Frothingham, reviewing the indications for the artificial opening of the mastoid, before the Ninth International Congress,[1] refers to the "tendency to extend the indications" to cases "in which the surface of the mastoid was free from tenderness and presented in every way a perfectly normal appearance," though he adds that "in many of these cases the indications cannot be clearly made out, and a considerable degree of uncertainty must exist as to the necessity, or even propriety, of an operation." The case I desire to report bears upon the same point; the importance of the subject and the rarity of the case fully justify its publication.

HISTORY.—The gentleman whose history I shall narrate was a patient of my father's and myself. He first called for medical treatment on March 17, 1890, complaining of severe pains in the left ear and dizziness. He gave the following history: As a child he had had measles; since early life he had had a chronic discharge from the left ear. At one time during childhood he had had a "swelling" behind the ear, which had been lanced by a physician and had discharged pus. For many years he had had occasional attacks of pain and dizziness, but never so severe or of such long and continued duration as in this last attack, from which he was already suffering for about three weeks, and which had latterly (March 15th) become so severe as to incapacitate him for his work as clerk. The patient was a hearty-looking young man, and seemed otherwise to be in good health. He had no elevation of temperature; his pulse was 60 per minute. The drum of the right ear was normal and hearing good. The auricle of the left ear was more prominent than the right, being turned slightly forward, but "had always been so." Behind it, and about over the centre of the mastoid process, was a small old scar, the result of opening the abscess mentioned above. The skin was freely movable over the bone. In other respects the mastoid process seemed normal, though there was a point somewhat above the level of the auditory canal which was slightly sensitive on firm pressure. There was a slight amount of flaky, offensive pus in

[1] Transactions, vol. iii., p. 832.

the auditory canal. After washing this out by injecting water (during which procedure the patient fainted), the deeper parts were found filled up with polypi. The hearing was entirely lost. He was given bromide of potash, and warm applications and instillations of cocaine and atropine were made to relieve the pain. The clinical record shows that polypous masses were frequently removed with the snare; nitrate of silver was applied several times; and the ear was washed out daily. But this seemed to have little influence on the pain, which was often very intense, and necessitated the occasional use of morphia. In the second week the iodide was given instead of bromide of potassium. Neither seemed to yield marked benefit, for the pain became even more violent about the end of the second week. There was at this time only one polypus remaining, situated in the upper part of the tympanum. But this was so sensitive that it was impossible to remove it by the snare, the slightest touch causing intense pain. Later, antipyrine was used, which reduced the pain much more effectually, though but temporarily, than any other means, such as warm applications, cocaine, or atropine instillations. At the end of the third week the pain became excruciating, but mercurial inunctions over the body and four leeches applied behind the ear relieved it, and the patient began to improve rapidly. From this time on the point of sensitiveness over the mastoid was not to be made out. Absolute alcohol was then applied daily for the polypi, which had grown rapidly during the time that the sensitiveness precluded any operative interference.

On *April 21st*, the patient had improved so much that he was permitted to go to work again. He had no headache; very slight giddiness. "Patient thinks that he is well." Polypi still present, and alcohol not appearing satisfactory, tannin in glycerine was substituted, and daily treatment continued. The patient's condition remained unchanged for almost five weeks. He continued to feel well and able to work as a clerk, and it seemed that he would soon be entirely cured, but on

May 25th, he complained that he had had a chill on the preceding evening, which had lasted some time and was followed by a severe headache, and that he had had a second similar one on the morning of the same day. He did not complain otherwise, excepting of diarrhœa, which had been going on about a week. His temperature was normal. Patient said that he had been in the country a few days before, and the possibility of its being

only malarial fever was entertained, and quinine (5 grs. in capsule) was ordered three times daily.

May 27th.—Is tired, sleepy, limbs feel sore. Has had more or less headache since first chill, which always increased greatly after each chill. The quinine has been kept up, but patient had three chills since he began taking it, in the evening of May 25th, and in the morning and in the evening of May 26th, but none to-day. Has *tinnitus aurium* from the quinine.

May 28th.—Had no chill yesterday or to-day, but sweats profusely and had severe headache last night. Still drowsy; has lost appetite; giddiness worse. Took castor-oil for the diarrhœa. At 3 P.M., temperature 100°, and pulse 94. His appearance is not bad.

May 29th.—Consultation with Dr. Preston. Patient was again thoroughly examined. His temperature in the morning 97.5°, in the afternoon 100°. The sensitive spot behind the ear has reappeared; on deep pressure he winces slightly. Polypi still present. Percussion of skull not painful; otherwise no abnormality; liver and spleen not enlarged. There is nothing pointing to thrombosis of lateral sinus, no sensitiveness or hardness in pressing jugular vein; no ophthalmoscopic change. Pupils react normally. While cerebral complications are suspected, it still seems unwarrantable to change the diagnosis of malarial fever, and quinine is continued. Had chill in afternoon.

May 20th, 9 P.M.—Pulse, 100; temperature, 103.5°. Headache intense. Antipyrine (10 grs.) given and headache relieved. Had had a chill at 2 P.M.

May 31st.—Chill in forenoon.

June 1st and *2d.*—Chills early in the morning. The chills of late are all followed by great rise of temperature. After this time they became less regular, but even on those days when there were no chills there was always a rise of temperature, which would sometimes reach 104°. The patient complained at this time of continual headache which became excruciating when he had a chill. The headache was generally limited to the left side of the head, though it would often become a general headache when severe. The patient became feeble, lost his appetite, looked haggard. Quinine intensified his pains and had to be discontinued. Antipyrine relieved him very little, though he was often forced to take it several times a day (10-grain powders).

About *June 5th* the rise of temperature became continuous,

ranging from 101° to 103°, but was very irregular. The headache persisted. During this time there was no distinct sensitiveness to percussion over the temporal bone or in other parts of the head, including the point behind the ear mentioned earlier in the history.

On *June 7th* the patient became delirious for about an hour. An ophthalmoscopic examination showed nothing pathological.

June 8th.—The patient was very low, had high fever and complained of intense pain. He was perfectly conscious, but had become very weak. His ear trouble had not shown any change; there was still a slight discharge which was very offensive, and which had been washed out daily. There was no œdema near the ear, no hardness or sensitiveness of the jugular vein. The pupils were contracted, but were equal and responded to light. Intracranial complications, which had long been suspected, were considered unquestionably present. Extensive caries, or a large collection of pus in the ear or in other parts of the temporal bone seemed almost to be excluded.

For reasons to be given below thrombosis was looked upon as improbable, and cerebral abscess as the more likely complication, and this was believed to be situated in the left temporal lobe. It was decided to make an attempt to find it by trephining and probing on the following day.

June 9th.—Patient's condition same. Felt numbness in the right hand for some time in the forenoon, which, however, passed off again. At half-past four in the afternoon the operation was begun. Drs. Geo. T. Preston, John W. Chambers, and my father, Dr. A. Friedenwald, assisted me. At this time the patient's temperature was 104°.

Operation.—The left side of the head was shaved, washed with soap and water, and bathed in a strong solution of bichloride. The instruments were disinfected in a carbolic-acid solution, and throughout the operation the antisepsis was carefully guarded. Chloroform was administered. For landmarks Von Bergmann's guidance was followed: From a point 4 *cm* behind the external auditory canal in a line made with the lower margin of the orbit, ascend perpendicularly for 5 *cm* to reach the point for trephining. An incision two and a half inches long, parallel with the basal line, was made, and on its middle a second perpendicular incision running upwards. A 1-*cm* trephine was used over the point mentioned above; the skull was very thick. Having released the button, the

dura mater protruded somewhat into the opening and pulsation was very easily perceptible. The dura was then opened and every part of the lobe was probed for the supposed abscess. The instrument used for this purpose was a somewhat pointed grooved-director, suggested by Dr. Chambers. At one time some cerebro-spinal fluid escaped, evidently from opening into the lateral ventricle, but no pus was found. Hemorrhage was slight. Seeing that there was no abscess here, we immediately decided to close the wound, dress it with iodoform (using strains of catgut for drainage), and cover the wound with collodion, and then to proceed to open the mastoid, with the intention of opening into the middle ear. An incision parallel with the posterior margin of the auricle and almost 1 *cm* from the latter was made. Upon cutting through the skin and periosteum and pushing it aside a circular opening was found in the surface of the mastoid process (about 1 *cm* in diameter). This opened into a large space which was entirely filled up with a white lamellated mass, which was recognized immediately as a cholesteatoma, and which was rapidly removed, and with it very foul-smelling pus, with a sharp spoon. In order to reach the inner parts with the spoon and with the finger it was necessary to enlarge the opening with a chisel. It was then evident that this cavity communicated freely with the external auditory canal. It was irrigated with a mild solution of carbolic acid. The wounds were sewed and an iodoform dressing was applied. The patient appeared to bear the operation well, recovered his perfect consciousness, and said that he felt much better than before. The temperature fell to 98.8° four hours after the operation, (Pupils small—1. 5–2 *mm*). His condition was encouraging. The night was passed restlessly and

June 10th, he again complained of pain in the head. During the afternoon the temperature rose to 101° and the patient became delirious for a while. The pain in the head and ear increased. The patient was very talkative.

June 11th.—Temperature continued to rise till it reached 103° late in the afternoon; speech became rather heavy. The dressing of the mastoid wound was renewed.

June 12th.—Patient lapsed into unconsciousness about two in the morning. Does not speak and cannot be roused. Breathing stertorous. Temperature 102°. Death at 9.30 P.M.

I may mention here that the pulse was never much affected. During the early part of the treatment it varied from 75 to 85;

after the chills it rose to between 85 and 98; after the operation it was about 82 to 84. The post-mortem examination was made June 13, 1890, 7 A.M., by Dr. N. G. Keirle, from whose notes I quote the following: The opening in the bone (made by trephine, Fig. 1, *e*) corresponds to the lower posterior margin of temporal lobe at the termination of the fissure of Sylvius. A thin clot of

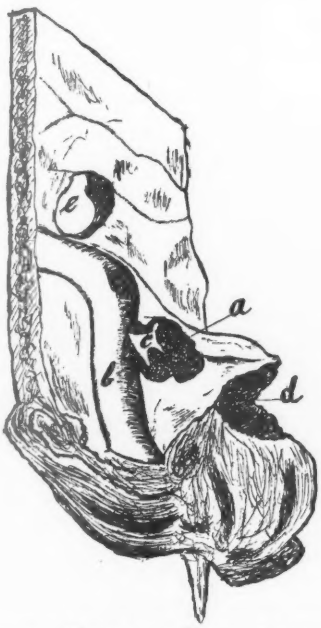

FIG. 1.—TEMPORAL BONE. INNER SIDE SEEN FROM BEHIND.

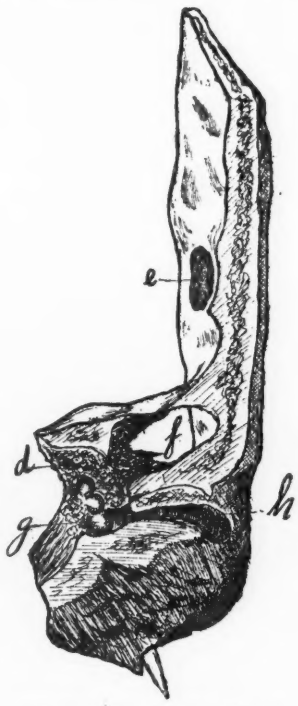

FIG. 2.—TEMPORAL BONE. ANTERIOR VIEW.

blood lines the inside of left side of the dura mater about 1 to 2 *mm* thick. *A greenish layer of pus, covering the convex surface of left frontal and parietal lobes,* seems to be situated in the pia mater. Some larger veins contain whitish material (pus ?). The cerebral cortex does not seem to be softened, except at the posterior part of the left temporal lobe, where a round space about 1 *cm* in diameter and about the same depth is softened; this is just beneath the trephine opening, and here the dura mater presents an irregular opening. Sections of the entire brain reveal no abscess. In the temporal lobe there are a few fine red streaks marking the paths of the probe. The opening (about 1.5 *cm* in

diameter) at the base of the mastoid process externally (Fig. 1, *c*) communicates directly with the interior of the skull by a rough, irregularly circular aperture 1 *cm* in diameter (Fig. 1, *a*). The circumference borders immediately upon the lateral sinus (Fig. 1, *b*), in which a firm clot (?) can be felt; the dura is not opened at this point, but presents a thickened, rough, granular surface toward the aperture. When the sinus is slit up a white, firm mass is seen to occlude it, but not to adhere to its wall, which has a thin smear of soft, yellow mass (pus ?). The white plug, measuring 12 *mm* by 3 *mm*, examined microscopically, exhibits somewhat ovoidal cells, some papilliform and concentrically laminated and stratified cells (cell-nest), also cholesterine crystals and fibrine.[1] The temporal bone was removed in great part (Figs. 1 and 2), and its subsequent examination shows, in addition to the points mentioned above, that it is only the uppermost portion of the mastoid that is affected, that this contains a large cavity, 2 *cm* deep, and extending forward between the external auditory canal (Fig. 2, *h*) and the base of the middle cranial fossa, the latter being converted into an exceedingly thin plate of bone (Fig. 2, *f*). Besides this the preparation shows that there is extensive caries behind and above the tympanic cavity (Figs. 1 and 2, *d*), the carious part joining the cavity of the mastoid process. Three polypi (Fig. 2, *g*) are seen attached to the upper outer wall of the tympanic cavity.

In looking over the history of the case, we are struck by the almost entire absence of any sign denoting mastoid affection. It is true that we noted early in the history that there was a spot of sensitiveness over the mastoid process, but this was slight, difficult to find and disappeared after the leeching. It returned for a short time about two weeks before the patient's death, but was hardly noticeable. It appeared insignificant, but the post-mortem examination showed that this spot coincided with the opening found on the external surface of the mastoid process. *Inflammatory swelling or redness of the skin covering the part, or swelling of the skin of the posterior and upper wall of the external auditory canal,* which commonly indicate mastoid affection, *were entirely absent.* This obscured the diagnosis thoroughly.

[1] I examined material from other parts of the sinus and found it likewise to contain cholesteatomatous masses consisting of typical epidermoid scales.

But there were other facts equally misleading. For *during the early part of the history we could never detect any fever!* And *the apparent great improvement after the first month's treatment and lasting more than four weeks, during which the patient was free of pain, felt very well, and was able to work* from early in the morning till late in the evening without discomfort, *was extremely deceptive* and made it appear improbable that the chills, which suddenly followed, were due to an extension of the ear trouble. The regular recurrence of the latter justified the suspicion and the hope that they were of malarial origin. Neither could be entertained long. Quinine given in large doses without any apparent effect soon established the fact that it was a septic and not a malarial fever, and, convinced by the lack of objective signs that its source was not in the temporal bone, we concluded that it was situated within the cranium. The probability of this being the case, as either septic meningitis, cerebral abscess, or thrombosis of a sinus, was carefully weighed. Meningitis was excluded, for its symptoms, such as delirium, dilatation of the pupils, optic neuritis, paralysis of the limbs, rigidity of the neck, slowing of pulse, etc., were wanting. It was difficult to come to a decision between cerebral abscess and thrombosis of a sinus. For while the repeated chills and high temperature pointed to the latter, we looked in vain for other symptoms of this affection. There was no swelling around or tenderness or hardness of the internal jugular vein, or œdema about the mastoid, or exophthalmus, or optic neuritis, convulsions, delirium, metastases in other organs, or the like. On the other hand, it is well known that cerebral abscesses following suppurative processes in the ear commonly have their seat in the temporal lobe,[1] and abscesses in this part lack the presence of any localizing symptoms.[2] The conclusion was that abscess in the temporal lobe was the more probable and the operation made on the moribund patient was intended to relieve this.

The result has shown our conclusion respecting the form of intracranial disease to have been incorrect, but still it has

[1] According to Barr, quoted by Hartmann, 4th edition, p. 183, this was the seat in 55 cases of a total number of 76.

[2] Von Bergmann, "Chirurg. Behandl. v. Hirnkrankh.," p. 55.

shown that there was intracranial disease. This justifies our following the meagre signs of cerebral abscess and taking this only view that offered any hope of saving the patient's life.

It is highly probable that the beginning of the thrombosis occurred about four weeks before death took place, for it was then that the patient had his first chills. It is improbable that any operation performed during this time would have averted death. *The time when an operation would have proved successful was earlier, when the disease was still limited to the bone, but,* as I have attempted to show, *there was no evident indication for opening the mastoid process before pyæmic symptoms set in.*

There is one other point of interest to which I should call attention. Dr. Keirle discovered that cholesteatomatous masses were contained in the lateral sinus. This occurred without doubt by the direct extension of the growth through the ulcerated walls of the sinus into its interior.

A CASE OF LIVING LARVÆ IN THE EAR.

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Mr. T., American, age thirty-four, farmer, consulted me, July 27, 1888, stating that four days ago, while mowing, a fly crawled into his right ear. He removed the fly, dead, using a shaft of grass. There was no feeling of pain or discomfort until two nights after this, when the ear commenced to bleed, and, at the same time, an intense pain started, and both of these symptoms lasted until I relieved him two days later. While coming to my office "*three white worms*" dropped out of his ear.

When I saw the man he was nearly insane, both from the pain and from the fact that he thought that "his head was full of the worms." On inspection the auricle was found to be red and much swollen, the bandage that covered his ear was saturated with blood, and the meatus was seen to be full of squirming larvæ. I immediately syringed the ear with warm water, and by this means alone removed twelve larvæ. The auditory canal was abraded throughout its whole extent; the membrana tympani, although red, inflamed, and macerated, had not been perforated, but remained intact. After the removal of the larvæ, hearing distance, right, $\frac{c}{60}$; left, $\frac{0}{60}$. After placing a small pledget of cotton, saturated with boro-glyceride, in the auditory canal, the patient was sent to his home, being ordered to report on the next day. I did not see him again until at the end of a week, when the hearing was found to be normal in each ear, the abraded condition of the canal and membrana tympani to have disappeared, and the patient was discharged.

The larvæ averaged six *mm* in length and two *mm* in breadth, and, including the three that escaped from the ear before the

patient reached my office, numbered *fifteen* in all. They were of a yellowish-white color, and were filled with blood, that showed through the bodies. They were also remarkably active, remaining alive for over twelve hours in water, to which about three per cent. of chloroform had been added to test their vitality.

That the deposit of the eggs in the auditory canal was accidental is probable, as the man never had put any oil or other substances into his ear that would attract insects; also, as the fly was killed in removing, the eggs were doubtless pressed out of the fly at that time.

Dr. Roosa, in his "Treatise on the Ear," 1885, page 181, remarks: "Dr. Blake says . . . as yet they [larvæ] have always been found in connection with suppuration of the middle ear, with its consequent perforation of the membrana tympani." Also "Dr. Gruening reported, at a meeting of the New York Ophthalmological Society, in 1882, a case of living larvæ in the auditory canal when the tissues were sound, but his case is as yet unique in the literature, I believe."

Dr. C. H. Burnett, in "A Treatise on the Ear," 1884, page 291, mentions the case of "Dr. Kuntzmann, in which the ear attacked by the larvæ was entirely healthy before invaded by the fly which deposited the noxious egg." Dr. Burnett goes on to say: "From the investigations of Blake and others, it appears that, since maggots retain such firm hold upon the structures of the ear after they once get in there, syringing and instillations of fluids which would not injure the ear are insufficient to kill and dislodge such creatures. Blake, Gruber, and others are of the opinion that nothing short of actually seizing the maggots with suitable forceps, and pulling them out, will satisfactorily remove them from the ear." I had no such trouble in removing the larvæ in my case, the larvæ coming out by means of gentle syringing, and showing no power or inclination to retain a hold on the lining of the canal, notwithstanding the fact that they were very bloodthirsty and active.

OPERATIVE MEASURES FOR THE RELIEF OF IMPAIRED HEARING.

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OPERATIVE measures for the relief of impaired hearing, the result either of suppurative or non-suppurative inflammation of the middle ear, have excited interest since the early days of otology. Politzer[1] suggests the division of adhesions, the result of suppurative inflammation, to allow the ossicular chain to move more freely, and to thus improve the hearing.

Kessel,[2] believing that fixation of the stapes was the cause of impaired hearing in one of his cases, performed the operation of "circumcision" of the stapes, or a division of its adhesions to the surrounding parts, as a means of mobilization.

Most of the later works upon otology cite such procedures more as matters of historical interest, than as methods to be employed in the treatment of diseased conditions of the tympanum. Moure,[3] however, in writing upon the subject, shows that it has from time to time attracted considerable attention among otologists.

Perhaps the most exhaustive contribution upon this subject has been made by Miot,[4] who has succeeded, in quite a number of instances, in mobilizing the stapes, thus improving the hearing, and reducing the distressing subjective noises. Blake, in an interesting paper before the Academy of Medi-

[1] "Diseases of the Ear," American edition, Philadelphia, 1883, p. 499.
[2] *Archiv für Ohrenheilk.*, vol. xi., p. 199.
[3] *Revue de laryngol.*, vol. xi., p. 225.
[4] *Ibid.*, p. 49.

cine of New York, in 1890, also cited a number of instances, occurring in his own practice, where operative measures in the middle ear had been followed by success.

My own experience in this line has been somewhat limited, and yet in such cases as have been operated upon, the results have been most satisfactory.

CASE I.—Was that of a young man, æt. twenty, who had suffered for several years with suppurative inflammation of the right middle ear. The posterior segment of the membrana tympani was largely destroyed, the malleus handle lying in the anterior remnant, and drawn well forward. There was considerable purulent discharge from the ear. The surface of the inner wall of the tympanum was covered with a tissue, almost fibrous in its density, and yet with a surface velvety and soft. Under appropriate treatment the discharge was much diminished, but the hearing did not improve ; with the cessation of the discharge, however, the wall of the tympanum became less congested and thinner, and close inspection revealed, in the upper and posterior part of the cavity, the head of the stapes, apparently firmly fixed by the fibrous tissue before alluded to. Incisions were made in the dense mass about the head of the stapes in various directions, the idea being to liberate it from any adhesions, and permit it to vibrate freely. After the first operation, the hearing for conversation and for noises was much better, and subsequent operations improved it still further. The incisions also seemed to exert a beneficial influence upon the discharge, which has now ceased entirely, although for some time, a small quantity, apparently coming from the upper portion of the tympanic cavity, persisted. The improvement has been permanent, so far as I can judge, and has been noticed by the patient himself in his daily life. In fact, he says that he hears nearly as well as with his other ear.

CASE II.—Was a boy of twelve, who had suffered from chronic purulent otitis media, affecting both ears. When first seen, the hearing in the left ear, from which there was only slight discharge, was fairly good. The right ear was discharging freely, and the hearing was very poor, so poor that the patient had considerable difficulty in school. Under treatment, the discharge diminished, but the hearing did not improve. The right membrana tympani was largely destroyed. A perforation, occupying about two thirds of the entire membrane, exposed the upper and poste-

rior portion of the tympanic cavity to view ; the malleus was located in the anterior portion of the membrana remaining ; above, the border of the perforation covered the incudo-stapedial articulation. The edge was tense, apparently exerting considerable pressure upon the ossicular chain. A vertical incision was made through the edge, extending upward about $\frac{1}{16}$ of an inch. When the boy again reported, a few days later, the hearing was much improved, and the mother for the first time had noticed a decided change for the better in the hearing. The incision had relieved tension, as was evidenced by the fact, that by the separation of the edges of the wound, a good view could now be obtained of the stapedio-incudal articulation. At first it seemed advisable to divide this, but the improvement continued, and further operative procedure did not seem necessary.

Case III.—Was a girl of sixteen, in whom suppurative otitis media at an early age had destroyed both membranæ. After the discharge had been controlled, the hearing still remaining poor, operative measures were undertaken to improve the hearing, and were successful. In the right ear, the malleus handle was found to be firmly bound down upon the promontory, and the ossicles were rigid. A delicate knife, curved on the flat, was introduced into the tympanic cavity, and the adhesion was divided ; the hearing for the watch immediately increased from contact, to two and one half inches. Three days later, the watch was heard at eight inches. The improvement has continued for two months, and although at present there has been a return of the discharge, the result of a cold, the patient states that the hearing is still better than before the operation.

Case IV.—Was a young man of twenty, in whom an acute purulent inflammation had destroyed the entire membrana vibrans, leaving the tympanic cavity entirely exposed. The ossicles were notably displaced, and the tip of the malleus handle was drawn backward, upward, and inward toward the head of the stapes, to which it was attached by a firm adhesion. The division of this band, rendered the hearing of articulate speech in this ear practically normal.

A similar case is mentioned by Buck[1] ; also by Politzer.[2] Of course every case of impaired hearing due to suppura-

[1] "A Manual of Diseases of the Ear," N. Y., 1889, p. 287.
[2] Cited by Buck, *loc cit.*

tive inflammation in the middle ear, cannot be improved by operative interference. In none of the cases reported were the operations followed by inflammatory symptoms, and the pain in all was insignificant. It seems but just to our patients, therefore, in any case where there is a possibility of improvement by simple operative measures, not attended with risk, to give them the benefit of the doubt, after explaining that, in any given case, the amount of improvement is largely a matter of conjecture. In cases also, not dependent upon suppurative disease, but upon a catarrhal inflammation, with the formation of adhesions within the tympanic cavity, it seems that we are justified in opening the tympanic cavity, using antiseptic precautions, and to attempt to liberate the ossicular chain either by disarticulation of the incudo-stapedial articulation, or the division of existing adhesions, or by *brisement forcé* after the method of Miot.

Considerable work has been done in this direction by various otologists. Schwartze,[1] as early as 1873, excised the membrana tympani and malleus in a case of sclerosis of the tympanic mucous membrane; while, in 1878, Kessel[2] removed the membrana tympani, malleus, and incus, for the same pathological condition. In this country Sexton[3] has operated upon many cases of chronic catarrhal otitis media, by removing the drum membrane and one or both of the larger ossicles, and the results have been most satisfactory.

In all cases, it is to be remembered that the adhesions are not limited to the atrium, but may be located entirely within the fornix tympani, and that improvement will only follow when these are divided. To Bryant[4] we are much indebted for a clear description of these folds, as they exist in the tympanic cavity in a normal state, while Blake[5] has pointed out their clinical significance, and the operative measures to be employed in their division.

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[1] "Die Chirurgischen Krankheiten des Ohres," Stuttgart, 1885.
[2] *Archiv für Ohrenheilk.* Bd. xiii., p. 69.
[3] "The Ear and Its Diseases," N. Y., 1888, p. 385.
[4] ARCHIVES OF OTOLOGY, vol. xix., p. 217.
[5] *Ibid.*, p. 209.

A BLOW UPON THE EAR FOLLOWED BY DEATH IN A WEEK.

By TH. HEIMAN, of Warsaw.

Translated by Charles H. May, M.D., New York.

THE following history, though it presents nothing especially remarkable in symptoms, course, and result, is published on account of its interest from a medico-legal stand-point.

J. P., a private in the infantry, twenty-one years old, came under observation in my division May 1st, suffering from hemorrhage from the left ear, which had lasted two days.

The patient was apathetic and very slow in answering questions, but the following previous history was obtained. He had been feeling weak and indisposed for several days, but not complaining of any thing special was ordered to do field-duty with the other soldiers. On account of general weakness he was less energetic than his comrades, and was punished by his officer, receiving a blow upon the left side of the face across the ear; this caused severe vertigo, almost causing him to fall and preventing a continuance of his work. He was sent to the regimental hospital, walking several kilometres to reach the latter. He had never suffered from pain in the ear before, though occasionally some pus had shown itself in the left ear. Severe hemorrhage from the left ear resulted from the blow; this bleeding had not ceased at the time of entrance into the hospital. These statements of the patient were not confirmed by the physician who preceded me in attendance nor by his assistant; the latter stated that there was no hemorrhage from the ear until forty hours after the blow—that is, but a few hours previous to his being transferred to my care.

I first saw the patient at eleven o'clock in the morning, shortly after his admission. He was tall, robust, well nourished, but somewhat anæmic. He lay upon his back. He answered questions somewhat indistinctly and unwillingly, and was apathetic; an unimportant dulness of intellect was also noticed. His tongue was dry and its motions seemed rather embarrassed in pronouncing words. His eyes seemed somewhat protruding; pupils equally contracted, responded to light. There seemed to be no pain or tenderness of the head, either general or circumscribed, either spontaneous or upon percussion. Skin and knee reflexes normal. Upper and lower extremities were free and active in their movements. Patient was able to sit up in bed and to move about the room; but in walking there was slight vertigo and nausea. Movements of the head were normal in every direction. Neither contractures, pareses, nor convulsive movements were observed in any part of the body. Temp. 40.5° C.; pulse 120, rapid and small. Recently dried blood was observed on the left auricle, and in the corresponding external canal a moderate quantity of bloody, purulent secretion. The drum-membrane was reddened and presented a small perforation in its anterior half, this opening appearing as a pulsating point. Inflation was rendered difficult on account of swelling of the Eustachian tube and of the middle ear. There was B. C. as well as A. C. for tuning-fork C on both sides. A. C. diminished on left side. Watch only heard on contact on left side. Right ear normal, functionally and anatomically. There was marked increase in the size of the spleen and tenderness over the region of the cæcum. The patient received 15 grains of calomel, an ice-bag was applied to his head, and the ear was washed out with 1:6000 sublimate solution and closed with iodoform gauze. I diagnosticated the case as otitis media suppurativa, believing it to be complicated with a general infection. Possibly the aural trouble was independent of the general affection. Evening temp. 40° C.

May 2d.—A.M.: Temp. 39.4°, pulse 100. Patient felt better. Tongue dry and covered by a thick, brown layer. He had four involuntary fæcal movements. Vertigo had disappeared. Movement of the left eyeball diminished; paralysis of abducens of left eye. Moderate amount of purulent secretion from left ear. Patient complained of pain in left carpo-radial joint, though there were no objective signs to corroborate this. Quinine and muri-

atic acid were administered. A 3 P.M. the physician-in-chief of the hospital saw the patient and found him unconscious and delirious, and directed the patient's transfer to the internal medical division ; during the balance of his illness the patient was treated conjointly by a therapeutist and by myself. P.M.: Temp. = 40°. Violent delirium during the night.

May 3d.—A.M. : Temp. 40.2°, pulse 120. Consciousness returned, although patient was still very apathetic. Left carpo-radial joint was swollen and painful. Involuntary discharges of urine and fæces. In other respects condition resembled that of the day before. Infusion of valerian was prescribed, and after shaving, corrosive-sublimate vaseline salve (2.0:32.0) was rubbed into the scalp. P.M. : Temp. = 40°.

May 4th.—A.M. : Temp. = 40.4°, pulse 100. Passed a sleepless night, delirious, escaping from bed. After questions were repeated several times, he answered unintelligently. Reflexes diminished. Left pupil dilated. P.M. : Temp. = 40.2°.

May 5th.—A.M. : Temp. = 40°, pulse 124. The discharge from ear ceased ; drum-membrane is reddish-white and perforated. Head tender upon slight percussion. Ptosis of left upper eyelid. Face jaundiced. Tongue dry ; mouth contains thick, offensive mucus. Distinct fluctuation in left radio-carpal joint. Continuous delirium. Patient remained in this condition until 6 A.M. on the following day, when he died.

The following changes were found at the *autopsy :* Jaundice. Pachymeningitis interna purulenta diffusa ; numerous small subarachnoidal hemorrhages ; hyperæmia of the substance of the brain and of its membranes ; circumscribed basilar meningitis. A decolored (yellow) thrombus was found in the superior longitudinal sinus ; dark-red ones were found in the transverse sinus and in the internal jugular vein. After removal of the temporal bone and of the dura mater adherent to its inner surface, three small openings were seen on the inner surface of the pyramid ; these led to the tympanum. At this point the bony wall was very thin and transparent. After sawing through the pyramid along its outer wall, parallel to its upper margin, and continuing the section through the entire thickness of the mastoid portion of the temporal bone, it was noticed that the upper surface of the latter had become sclerosed so as to present a thickness of more than half a centimetre ; in the sclerosed portion there were, at various points, small, softened areas containing pus and particles of bone.

The tympanum and the mastoid process were filled with thickened pus. Many of the lamellæ of the mastoid process had been destroyed, so that in certain places there were large cavities containing pus. Besides pus, pseudo-membranes and bands were also found in the middle ear; these bound down the ossicles and fixed them to the adjacent parts. The mucous membrane of the tympanum was ulcerated at certain places, in others it presented granulations. The portion of the tympanum which was next to the cavities just described contained nothing but air. Internal ear was not examined. After removal of the anterior bony wall of the external auditory canal the drum-membrane was exposed and presented a small perforation in its anterior half.

In addition, there were also found the following changes: Inflammation of the left radio-carpal joint; incipient, exudative, purulent pleuritis; metastatic infarction in the lower lobe of the right lung; parenchymatous hepatitis and nephritis; catarrhal enteritis, accompanied by a great many extravasations of blood into the mucous membrane.

This case presented many diagnostic difficulties at first; these were due partly to the character of the ear affection, partly to the complicating general disease. Examination of the ear showed the existence of an acute or of an exacerbation of a chronic inflammation of the middle ear, with perforation of the drum-membrane—symptoms which are usually present in non-traumatic cases. There was nothing to indicate traumatic etiology in this case except the blood upon the auricle (which did not prove any thing); there was also the statement of the patient, which was not entirely trustworthy. But, on the other hand, it could not be asserted that traumatism had not been an etiological factor. The patient stated that he had had no previous aural disease; therefore his affection must, in the absence of symptoms denoting chronicity, be regarded as an acute affection or as a chronic trouble which presented an exacerbation.

Independent of the cause and character of the aural disease there arose the question of the character of the general affection, and the relation which this bore to the aural trouble; this presented the chief difficulty originally. At first sight, the answer to this question seemed easy; the case

might be explained by supposing that a purulent inflammation of the middle ear had been produced by traumatism and had then resulted in septico-pyæmia terminating fatally. Although purulent inflammation of the middle ear following traumatism is not at all rare, and although such cases may be attended with serious and even fatal consequences, still it would be very extraordinary to have a case like the one we are considering, in which such pronounced and violent symptoms and manifestations of serious blood-poisoning developed as early as two days after the traumatism; I, at least, have not been able to find any mention of such a case in all the otological literature which I was able to consult. On this account I was very cautious in accepting the statements of the patient. Bearing these points in mind, and influenced by the general symptoms which the patient had when first examined and which he had had several days before, I diagnosticated the case at first as one of typhoid fever complicated by a purulent inflammation of the middle ear as a result of a blow upon the ear. But on the second day I found it necessary to change my original diagnosis on account of an absence of certain typhoid symptoms, the character of the fever, and the general condition of the patient, and to regard his affection as an infection, a septico-pyæmia, which was in direct relation to the aural disease; this view could but be strengthened by the swelling of the radio-carpal joint. Notwithstanding the assertions of the patient, I could not avoid thinking that the aural disease must have been a chronic one; the character of the secretion strengthened this view to a certain extent. The secretion was not pus mixed with blood, but the bloody purulent discharge which we find in caries of any part of the temporal bone. My diagnosis was confirmed by the autopsy, which indicated that the course of the disease had been the following: The case was one of an old caries of the left mastoid and walls of the tympanum, which had remained quiescent for a long time, but had been subjected to an exacerbation from some unknown cause, possibly through traumatism; unfavorable circumstances existing, this led to thrombophlebitis of the superior longitudinal sinus resulting in

septico-pyæmia. I am not certain about the exacerbation being the result of the traumatism, since the patient was not well and complained of general weakness before the blow was inflicted. I believe the influence of the traumatism was limited in this case to a hastening of the whole process in an individual who was affected with disease of the ear. The pathological changes found in the mastoid process and in the middle ear, as well as the condition of the patient before the traumatism, made a fatal termination sooner or later, and certainly before a very long period, probable, even without the traumatic influence.

It seems superfluous to add observations on the importance of the autopsy as affecting the medico-legal aspect of this case. Post-mortem examination demonstrated the real cause of death; it guarded us from false conclusions and saved a person from the charge of manslaughter.

The history of this case also demonstrates how little confidence can be placed in the statements of some patients, especially when they are interested, or when they are desirous of revenging themselves on a person who is supposed to have injured them or who really has done so. In our case, I believe the patient concealed his old trouble merely out of a feeling for revenge, even though the result cannot exclude the possibility of his really having been unaware of the existence of any aural affection; this can often be observed in old cases of aural disease which run their course without any very marked symptoms, especially among the less intelligent class of patients.

A RARE CASE OF AUDITORY REFLEXES.

Supplementary to the Case Reported in Vol. xviii., Nos. 3 and 4 of THESE ARCHIVES.

BY PROF. H. STEINBRÜGGE, GIESSEN.

Translated by CHARLES H. MAY, M.D., New York.

AFTER the report of the case alluded to in the title of this paper had been printed, I was informed through the kindness of Prof. Moss, that Prof. Erb had presented a case of respiratory spasms closely resembling my case, at a meeting of the Heidelberg Medical Society last winter. Investigation proved that this case was sufficiently interesting to be presented to the readers of these ARCHIVES as a supplement to the one I had reported; the following history is a copy of the proceedings of said society relating to this case (vol. iv., part 2), for which I am indebted to Prof. Erb:

Meeting of the Medical Section, Feb. 12, 1889; Prof. Erb. Presentation of Patient: Curious Reflex Neurosis.

"Man, forty-four years old, who has suffered from a very remarkable reflex spasmodic condition, involving the respiratory apparatus in particular; this has lasted eight or nine years, during which time he was under observation and treatment at very many clinics. This spasm follows every sort of sensory, optical, and auditory impressions of a sudden character (sudden contact and pressure upon the skin, especially upon the abdomen; rapid approach of the hand towards the eyes, clapping the hands, the ringing of a bell, the dropping of an object, the crack of a whip on the street—in short, after every unexpected noise of a moderate character); patient moves both legs in a kicking, spasmodic

manner, suddenly jumps up, and is seized immediately with a very remarkable respiratory spasm. This spasm consists of a series of *loud expirations* (through the nose) rapidly following each other, while the extended mouth is closed during each expiration, but opened, making a kissing sound during each inspiration. In addition there is presented a picture of labored respiratory movements affecting both chest and abdomen. The respiratory movements are at first very rapid ; their frequency and depth then diminish if there is no new irritative factor ; but any additional source of irritation will again increase these respiratory movements, and the attack may be prolonged for any desired period in this manner. The appearance of the patient during these attacks is a most curious one.

In other respects, the patient presents no abnormalities, excepting his gait, which is somewhat stiff, reminding one of ataxia, and the existence of impotence for a number of years. Vision, pupils, sensibility of the skin, smell, taste, muscular sense are all normal. Acuteness of hearing is good, rather diminished ; on both sides there is moderate galvanic hyperæsthesia of the auditory nerves with paradoxical reaction. Motion is normal everywhere. Skin and tenden reflexes are preserved and are not increased. Bladder and rectum normal. The diaphragm presents normal respiratory movements. All internal organs are normal, including pharynx and larynx. There are no real hysterical phenomena.

Besides the auditory apparatus, the portions of the body from which attacks emanate most readily are the skin of the abdomen, that of the soles of the feet, of the thighs, and of the genital region.

Prof. Erb diagnosticates the case as a functional neurosis, probably related to hysteria, consisting of an expiratory spasm associated with unusual movements of the mouth and lips, and induced by a reflex spasm in certain muscles of the thigh. It might be due to a circumscribed increase in irritability of certain (respiratory) centres of the medulla or also of the spinal column.

No information was obtained concerning the previous history and the etiology of the affection which would be of value in the consideration of pathogeny. All methods of treatment hitherto employed had been unsuccessful.

The history of this case is different from that observed by myself, in that the patient was affected by sudden noises

such as clapping of the hands, the crack of a whip, etc. In addition, Dr. A. Hoffman, now assistant in the clinic for internal diseases, at Heidelberg, was kind enough to inform me "that no examination has been made regarding the influence of musical tones."

As affecting the question of the existence of double perception-areas and double routes for tones and for noises, it would have been interesting had experiments in the production of spasms through musical tones resulted negative. Very likely the patient will appear at other clinics, and then possibly the experiment can be tried.

It is evident, however, that even though experiment showed that spasms could be excited by musical tones as well as by noises, the existence of double perception-areas and routes could not be assumed, since excessive irritation of centres might result in the production of both sensory impressions notwithstanding the existence of separate routes. Conclusive evidence of the existence of double perception-centres and double routes would be obtained by nothing short of the following crucial experiment: Spasms only produced by musical tones in the patient from Giessen, exclusively excited by noises in the Heidelberg case.

TWO NEW INSTRUMENTS.

1. PALATE-RETRACTOR. 2. RETRACTORS FOR KEEPING THE SOFT PARTS SEPARATED DURING THE OPERATION OF OPENING THE MASTOID PROCESS.[1]

By AD. BARTH, of Berlin.

Translated by Charles H. May, M.D., New York.

(*With two illustrations.*)

THE two instruments which I am about to describe I can recommend as very useful, having tried them for several years. The first, the *palate-retractor* (Fig. 1), is

FIG. 1.

not new—it is a modification of those recommended by Krause and by Hartmann. It consists of a main portion bent into the shape of a hoop, on one end of which is a hook for the uvula and soft palate, and on the other an addition bent at right angles, through which a movable bar passes. Thus far the description corresponds to the palate-retractor of Krause. In Krause's instrument this movable bar is controlled by a screw, which mechanism consumes some time in applying the retractor, and again in removing it; in addition to this, on account of this screw motion, the plate which rests upon the upper lip must also be movable, and this also

[1] Presented at the meeting of North German aurists in Berlin, April 22, 1889.

diminishes the facility with which the instrument can be used. Probably the principal reason that Hartmann's palate-retractor has not become more popular is the fact that a portion has to be introduced into the nose in order to keep it in place—this is disagreeable to many patients; besides this the use of the instrument is attended with less cleanliness than when it can be fastened to the upper lip. The instrument which I present resembles Krause's, except that the movable bar does not work by a screw, but is simply pulled out and pushed in. A spring pressing upon the lower toothed surface holds the bar in any desired position; this spring is loosened by a slight pressure upon the button attached to its upper end. The plate attached to the inner end of the movable bar is attached firmly and bent so that in applying the instrument it will rest principally in the canine fossæ. I do not see any advantage in covering this plate with rubber; on the contrary, without any such covering it is much easier to keep clean. Of course, every one will prefer the instrument which he has become accustomed to. But even so, I believe that the palate-retractor in question is the most easily applied of all self-retaining instruments, and the most convenient for both physician and patient. These are the very points which decide the possibility of posterior rhinoscopy, and of operations in the naso-pharynx, under guidance of the eye, in many cases. I always cocainize the naso-pharynx when applying the instrument; the toothed bar is drawn back completely and held in the right hand, the hook is pushed behind the uvula and upwards, and the whole instrument, and thus also the soft palate, is drawn forward; holding the vertical part of the instrument in the left hand and pressing upon the button found there, the plate is pushed ahead until it rests securely upon the upper lip. To remove the instrument, the left hand presses upon the button of the spring, and the toothed bar is withdrawn with the right; then the hook is pressed forward until it encounters the posterior pharyngeal wall; it is then rotated downward and withdrawn. I have had very few patients who have not tolerated this palate-retractor very well, even at the first attempt.

The second instrument consists of *retractors for separating the divided soft parts during the operation of chiselling open the mastoid process.* It consists of two bars, each provided with three sharp-pointed hooks; these bars are connected in such a manner by two rods and a screw, that when approximated the hooks form a single line.[1] (Fig. 2.)

FIG. 2.

After having divided the soft parts, including the periosteum, and having separated the latter from the bone, the hooks of the retractor are applied so that the points touch the bone at the spot where we wish to continue to operate. Then they are separated; the points of the hooks grasp the deeper soft parts, while the arms from which the hooks spring separate the more superficial soft parts and especially the divided integument, and push the auricle forward. When the instrument is in place and is being screwed up so that its two portions become separated, the soft parts are put upon the stretch and can be divided; in this way, for instance, the tendon of the sterno-mastoid can be divided more effectually. When completely separated, the space included between its two arms presents a clear field for operation. Before removing, the hooks must first be reapproximated. This instrument presents many advantages: In the first place, we can dispense with the services of an additional assistant to keep the margins of the wound apart with retractors; the instrument rests more quietly and the parts can be separated more effectively than when an assistant performs this duty; the wound can be kept cleaner, for when an assistant holds the retractors he is apt to grasp also the head and hair of the patient, and the latter often finds its way into the wound; hemorrhage from the

[1] The instrument is now made with the modification proposed by Truckenbrod—the middle hook is somewhat shorter than the one on each side of it.

soft parts is almost completely controlled by pressure of the instrument, so that even when this retractor is removed at the end of the operation, no ligaturing is necessary. These hooks are furnished in three lengths; the medium size is adapted for all cases where there is no special swelling of the soft parts; if there is much swelling the longest size should be employed. The instrument was made for me by Détert, Französische Strasse 53, Berlin.

THE ROUTE OF RESPIRED AIR THROUGH THE NOSE.

By R. KAYSER, Breslau.

(*With illustration.*)

Translated by Charles H. May, M.D., New York.

I.

THE question of the direction of the stream of air through the nose in breathing, especially in inspiration, has been discussed for some time, chiefly by anatomists. Bidder,[1] H. Meyer,[2] Zuckerkandl,[3] and others have endeavored to determine the direction of the stream of air through the nose by considering the anatomical structure of this organ; their results were not, however, uniform. In general, it was believed that in ordinary inspiration the air passed principally through the inferior and middle channels of the nose—especially through the inferior, since this was the shortest route to the naso-pharynx—that is, through the *pars respiratoria;* while the *pars olfactoria* was scarcely touched by the air in quiet respiration, and in snuffing in a manner not sufficiently understood.

To the best of my knowledge, E. Paulsen[4] was the first to investigate this question experimentally. He "considered it almost impossible to draw any reasonably certain conclu-

[1] Wagner's "Handwörterbuch der Physiologie," art. "Riechen."
[2] "Lehrbuch der Anatomie," Leipzig, 1873.
[3] "Normale und Pathologische Anatomie der Nasenhöhle," Wien, 1882.
[4] Experimental Investigation of the Route of the Air through the Nasal Cavities, by Dr. E. Paulsen. *Sitzungsb. der K. Akad. der Wissensch.*, April Heft, Jahrg. 1882.

sion regarding the route of the respiratory air from a consideration of the structure of the nasal cavities," and he endeavors to ascertain this information by direct observation. Under Exner's guidance he began by placing pieces of red litmus paper in the nasal cavities of heads of cadavers, which had been preserved in alcohol, and which had been sawed in two previous to use, and then drew air through them from the trachea, having charged the stream with ammonia. Subsequently, at Hensen's advice, he improved upon this incomplete and inconvenient method by placing the head of the cadaver under a bell-jar within which were small sponges saturated with a one-per-cent. solution of osmic acid, and drawing this atmosphere laden with osmic acid through the nose. Both methods yielded essentially similar results: "In inspiration the bulk of the air takes an upward course, rises to the bridge of the nose, passes along the roof of the nasal cavities until it reaches the posterior portion, when it again descends along a curved route." The lower nasal passage is not touched by the current of air, and the "inferior border of the latter extends at no point beyond the middle of the lower turbinated body." The principal objection which can be brought against these experiments of Paulsen is that they were observed upon the cadaver, partly in alcohol preparations, and that on this account they are deficient and ignore the important erectile tissue of the nasal mucous membrane, especially of the turbinated bodies, in the living organ.

I have succeeded in doing away with this objection by a simple method, as easily applied upon the living as upon the cadaver. This method, which will be called in brief the "powder-experiment," consists in inspiring air laden with a fine powder and observing the route of the air by the view of the deposit of this powder within the nose. For this purpose I use powdered magnesia almost exclusively, on account of its lightness and insolubility. I filled a small sieve with this powder, held it in the neighborhood of the nose at about the height of the forehead, and produced clouds of magnesia dust by gently tapping upon the sieve whilst the person experimented upon inspired; or upon the

cadaver this dust was drawn in through the nose, from the trachea, by two Wolff's (aspiration) bottles—generally five litres in twenty to thirty seconds. Then the nasal cavities were illuminated and examined by a reflector and speculum, and in this way it was ascertained upon which parts magnesia had become deposited. I also tried Paulsen's experiments with osmic acid upon heads of cadavers, having tried the powder-experiment previous to sawing through the skull. In this way I demonstrated that the powder was really deposited upon the parts which had become stained brown the deepest, except that the powder did not seem to extend as high as did the osmic-acid discoloration—a result which is very easily comprehended. My method presents another advantage. Since the powdered magnesia can easily be brushed off and washed away after each experiment, the same head will answer for numerous experiments under different conditions, and these may be compared one with the other; the results upon the cadaver may also be compared with those upon the living, and *vice versa.*

If the powder-experiment be tried upon a fairly normal nose in the living, rhinoscopy will reveal the following surprising picture: A more or less dense layer of white powder is seen at the anterior extremity of the septum, about 1½ *cm* from the point of the nose, at the level of the middle or upper portion of the inferior turbinated. Thence the white powder extends along the septum, describing a semicircle from before backward. The lower passage, the floor, and the lower border of the inferior turbinated body are entirely free from the powder; on the upper surface and the anterior extremity of the inferior turbinated body there are a few grains. The anterior vertical border of the middle turbinated body is thickly covered, also its lower border, and the lateral walls of the middle passage are well covered. Above the middle turbinated body, as far as it is possible to observe, there is powder, especially upon the septum. Posterior rhinoscopy shows some powder upon the upper part of the posterior pharyngeal wall; it is only with the production of very dense clouds of dust that, under normal circumstances, the deposit of powder upon the pos-

terior wall of the pharynx extends to the lower part opposite the lower nasal passage. There are, of course, modifications of this picture, depending upon the structure of the interior of the nose; it is observed only in cases of pretty straight septum and free passage in the upper part of the nose. If the upper part of the septum presents a marked convexity, the powder will not extend upward beyond this. The anterior end of the inferior turbinated body will present variations in the extent to which it is covered by the powder, these depending upon the amount of development. The powder-experiment shows the same result upon the cadaver, and corresponds with results of Paulsen's experiments with osmic acid already mentioned. Therefore I consider myself justified in asserting, considering also the nose in the living, that: *During inspiration in the normal nose, the bulk of the air passes along the septum, above the inferior turbinated body, describing a semicircle in its course, and extending upward nearly to the roof of the nose.*

II.

THE CAUSES OF THE ROUTE OF THE AIR THROUGH THE NOSE.

In estimating this question, I also made use of the experimental method, and I endeavored to ascertain what morphological relations of the nose determined the route which I had demonstrated.

Let us first consider the lower turbinated body, which is credited by many with considerable importance in determining this question. I sawed away the inferior turbinated body on the cadaver, and then experimented with the powder in the usual manner. The result was the deposit of powder in precisely the same manner as before the removal of this body; the experiment with osmic acid gave a similar result. This was corroborated upon the living. In advanced cases of atrophic rhinitis it is not rare to find that the entire inferior turbinated body has disappeared, or that only a slight ridge remains; if the powder-experiment be tried upon such patients, the powder will be found deposited

upon the middle turbinated body and upon the septum, in an arched manner upward, just as under normal conditions, and the lower passage, of extraordinary width, remains free from powder. If the inferior turbinated body be hypertrophied, especially at its anterior extremity, so that it projects markedly into the nasal cavity, a considerable quantity of powder will be deposited upon it. If access to the upper parts of the nose be interfered with by hypertrophy of the inferior turbinated body or, what is more common, by polypi which fill the middle nasal passage, these obstructing portions (hypertrophies or polypi) will show a very abundant deposit of powder, and there will also be considerable upon the lower part of the septum and upon the inferior turbinated body, almost to its border; but the floor of the nasal cavity will remain clear, except a little which has accidentally fallen there.

All this proves that, under normal conditions, the inferior turbinated body is no factor in determining the direction of the current of air—at any rate, that it is not the important factor claimed by many.[1] The septum is of consequence in regard to the direction of the current of air on account of the frequency with which deviations and outgrowths obstruct the passage. As is well known, the most frequent form of outgrowth is a larger or smaller comb-like spur (*crista septi*) from the lower part of the septum opposite or slightly below the level of the inferior turbinated body. Spurs of this sort have very little influence upon the direction of the current of air; in the powder-experiment the accumulation is found upon them, but extending no farther than when no such outgrowths existed. Not infrequently we find a convexity more or less flattened, in the upper part of the septum (*tuberculum septi*); occasionally this hides the middle turbinated body and almost touches the outer wall of the nasal cavity. Such a convexity seems to limit the penetration of air upwards and in marked cases of *tuberculum septi* no powder can be demonstrated above the convexity.

[1] Bidder (*l. c.*, p. 922) says: "The current of air entering the nasal cavity and striking the inferior turbinated body is deviated from its original course, and divided, by that obstruction."

The external configuration of the nose, and especially the position of the nares, is of the greatest importance in determining the direction of the current of air. The anatomists already mentioned realized this factor, but did not give it sufficient importance. Thus H. Meyer[1] says: "The air which enters the nose first passes in a direction perpendicular to the plane of the nares; the continuing aspiratory movement also gives it a backward direction; so that its real direction must be the resultant of these two." But he soon loses sight of the importance of the position of the nares in the consideration of what he calls the "nasal dam." Direct experiment proves, on the contrary, the marked importance of the position of the nares. If, in the living subject, a short glass tube covered with india-rubber be introduced into one nostril so as to close it completely, and held there horizontal so that its anterior opening is perfectly vertical, the experimental deposit of powder will not extend above the middle nasal passage. The same result is produced in a somewhat less complete manner when the tip of the nose of the person experimented upon is raised so that the nares are almost vertical. Upon the cadaver, we can dissect the outer wall of the nose from the bridge almost to the nasal bones and turn out the flap made in this manner; then the air will pass through in a straight line, and in using the osmic acid or the powder there will be a coating corresponding to the size of the external opening. But even in these cases, the actual lower passage of the nose, *i. e.*, the space between the floor and the lower turbinated body remains free from deposit. The reason for this is that the inferior margin of the anterior nares is on a higher level than the floor of the cavity of the nose, and that the latter has a greater or lesser sagittal concavity in addition to the frontal; this has already been pointed out by Schwalbe[2] and Zuckerkandl.[3] The extent of this sagittal excavation is best demonstrated by the use of the probe; if we introduce a probe into the inferior nasal passage, either in the living

[1] *L. c.*, p. 668.
[2] "Lehrbuch der Anatomie der Sinnesorgane," von G. Schwalbe, Erlangen, 1887, S. 63.
[3] *L. c.*, S. 33.

subject or in the cadaver, we will find that it does not come in contact with the floor at all points, being separated by a distance of several millimetres at about the centre, and that the probe passes above the lower border of the inferior turbinated body, crossing the latter at about the level of its centre. This space, bounded above by the probe, represents an inactive area in the ventilation of the nose in inspiration—the air passing above it. The great importance of the horizontal position of the nares can also be demonstrated by a simple physical experiment. If the powder-experiment be applied to a horizontally placed cylindrical tube, the magnesia will be found over the entire inner surface, but if the anterior vertical opening be closed, and a lower horizontal one of equal size be utilized, the powder-experiment will show the lower half of the inner surface of the tube to be free from powder over its anterior half, whilst the great mass of the powder has coated the upper wall. In a plaster model of one half of the nose, the septum being of glass, the current of air through the nose was observed by placing a smoking object (a stick of wood, the anterior end of which was covered with velvet and kept lighted) in front of the anterior opening and then aspirating air through the plaster nose; the clouds of smoke were then seen to pass in an upwardly curved direction. If the tip of the nose be sawed off so that a vertical opening remains anteriorly, the smoke will pass directly backward in a horizontal course when the experiment is repeated.

III.

THE IMPORTANCE OF THE DIRECTION OF THE CURRENT OF AIR THROUGH THE NOSE TO THE SENSE OF SMELL.

If we accepted the views advanced by Bidder[1] and others, that in quiet respiration the air takes the shortest route, and consequently must pass along the floor of the inferior nasal passage, it would be puzzling to understand how olfactory impressions were produced during quiet breathing. H. Meyer[2] says: "The position of the organ of smell in

[1] Bidder, *l. c.*, S. 921.
[2] Meyer, *l. c.*, S. 318.

the nose is such that neither the inspired nor the expired air can come in direct contact with it during quiet respiration." Both authors believe that the direction of the current necessary for creating an olfactory sensation is brought about by an elevation of the alæ of the nose, a very insignificant motion, and one often entirely absent when there is a distinct olfactory impression, a factor, furthermore, which seemed to have no influence whatever upon the current of air in the experiments. The mystery regarding the appreciation of smell in quiet breathing is solved, however, by proof that even in breathing of this sort the current takes a route curved upward towards the *pars olfactoria. The general opinion that the current of air passes through the pars respiratoria is erroneous.* The division of the cavity of the nose into a *pars respiratoria* and a *pars olfactoria* is permissible anatomically, but not justifiable physiologically.

From what has already been stated, it appears that the anterior nares are of marked importance in influencing the perception of smell. In this connection I would call attention to the observation of Béclard mentioned by Zuckerkandl,[1] that "the absence of the external parts of the nose impairs or completely prevents the perception of smell, and that this loss or impairment is relieved by the formation of an artificial nose." The observations of Fick[2] are also explained: that air impregnated with odorous vapor is not perceived when encountering the posterior nares, but is readily perceived when carried to the anterior nares. In short, the current of air passing through the anterior nares forms a stream, convex above, which impinges upon the *pars olfactoria* the more readily the nearer the nares are to the bridge of the nose.

The value of snuffing in relation to the sense of smell also appears in a new light after these observations. Bidder and Meyer regarded the increase in size of the nares as the important factor in this act. My own belief is that in snuffing the following factors take part: "First, inspiration

[1] *L. c.*, S. 59.

[2] Mentioned in Hermann's "Handbuch der Physiologie," Bd. III., Th. 2: Geruchsinn von v. Vintschgau.

is accelerated; in this way a greater quantity of air, and hence also of odorous material, is carried into the nose within a given time. Second, the more forcible inspiration is interrupted at short intervals. A single long and very rapid inspiration does not increase olfactory perception; on the contrary, it diminishes it. The short inspiratory efforts keep the air in the nose and force it upward more than a continuous stream would; the different parts of the air composing the current are made to preserve their original upward direction for a longer period, and do not pass directly backward so soon. I have become convinced by direct experiments with the powder upon the cadaver, that with increased rapidity of current, the powder will be deposited higher if the aspiration is applied in an interrupted manner (by pressing the rubber tube together). Hence snuffing acts by keeping the air in contact with the *pars olfactoria*, dilatation of the nares being a factor only by increasing somewhat the quantity of the air.

Paulsen has demonstrated the same thing in reference to the expiratory current. I have not conducted any experiments in this direction. The correctness of Paulsen's observations is, I believe, assured even in the living, when we consider that in expiration also the current of air has a direction which is at right angles to that of the nares, passing upward at first, and then anteriorly in a curve. Finally Aronsohn [1] has demonstrated that the perception of smell during expiration is not as limited as was hitherto believed, just as his demonstrations disproved many other views of earlier authors.

IV.

THE SIGNIFICANCE OF THE STRUCTURE OF THE RESPIRATORY PART OF THE NOSE AS AFFECTING BREATHING IN GENERAL.

If the direction of the inspiratory stream upward and backward in a curved current be the normal one, then all

[1] Experimentelle Untersuchungen zur Physiologie des Geruchs. *Arch. f. Anat. u. Physiol.*, 1886, physiol. Abth.

changes in the interior of the nose which modify this direction must interfere with inspiration and cause a diminution in breathing—*i. e.*, with equal inspiratory force the quantity of inspired air will be decreased. On the other hand, all nasal changes which do not influence the normal direction of the current of air need have no restricting effect upon breathing. Hence it is chiefly obstructions in the upper part of the nose—above the inferior turbinated body—that need be considered in this connection. The inferior nasal passage may be very spacious, and yet there will be respiratory obstruction if the middle and upper passages become narrowed. The incoming air will first impinge upon the masses which fill its natural passage and then continue through the inferior channel. On the other hand, the lower passage may be completely obstructed without producing any interference with respiration. At any rate, it is quite certain that nasal stenoses differ in respect to their influence upon breathing.

This also corresponds to clinical experience on the subject. There are many patients complaining of difficulty in breathing in whom we are surprised to find a very small inferior turbinated body with a very roomy lower channel, whilst stenosis is found only in the middle and upper portions of the nose. On the other hand, we may find hypertrophies filling up the entire lower portion of the nasal cavity without producing any respiratory obstruction. Of course, if the inferior turbinated body is swollen to an extent to block up the middle passage and the entrance to the upper one, there will be difficulty in breathing.

In practice, estimation of these relations is rendered difficult by having to distinguish between actual objective obstruction of the nose and the subjective feeling of obstruction. The latter sensation always exists when parts of the nose which are normally free come together so as to touch without any real impediment to breathing having been produced. If, in a patient whose nose is obstructed in its upper part, we raise the tip of the nose so as to make the nares more vertical, the objective obstruction will become markedly less, but the subjective feeling of obstruction will persist. It is

curious that the majority of cases of nasal obstruction due to polypi affect the upper part of the nasal cavity—the natural channel for the air. The growth of these polypi is almost always towards the current of air, and thus they represent what might be called a certain "aërotropy." If the magnesia-powder experiment be undertaken in a patient, the upper and middle passages of whose nose are blocked up by polypi, we will find these masses thickly covered with the powder—a demonstration of the fact that the current of air strikes up against them and is interrupted by them.

Similarly, an obstruction to breathing in the posterior portion of the nose and the naso-pharynx will result, when access to the posterior nares is interfered with, corresponding to the middle and upper nasal passages. Hypertrophy of the posterior end of the inferior turbinated body becomes important only when it extends some distance into the naso-pharynx, and when it has a certain amount of motion so as to be capable of closing the passage. It is only when we consider their effects upon the natural direction of the current of air that the significance of adenoid vegetations becomes manifest. These growths are present in the upper part of the naso-pharynx, and hence obstruct breathing even before they have attained any great size. As a matter of fact, we find very often that the removal of large quantities of adenoid vegetations does not relieve the impediment to breathing entirely if portions of even insignificant size have been left behind. This I had occasion to observe not long ago—a case occurring in a girl of thirteen, in whom such residues after the removal of adenoid vegetations had produced a continuance of the obstruction to breathing—but this was confined to the left side, corresponding to the situation of the adenoid residue.

There is no doubt that the upward direction of the current of air favors its supply of warmth and moisture; the route is made longer and narrower. Whether this course, as compared to a perfectly straight one, offers any appreciable advantages, my experience[1] has shown to be doubtful.

[1] Die Bedeutung der Nase, etc., für die Respiration, von Dr. R. Kayser. Pflüger's *Arch. f. d. ges. Physiol.*, Bd. xli., 1887.

THE SIGNIFICANCE OF THE DIRECTION OF THE CURRENT OF AIR THROUGH THE NOSE IN ITS RELATION TO THE REMOVAL OF DUST.

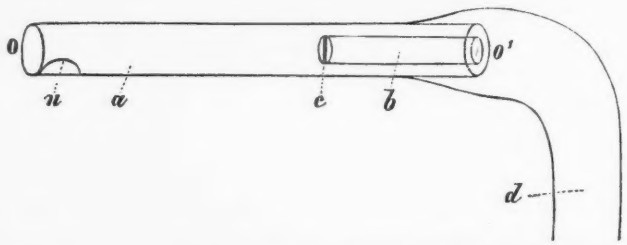
The capacity of the nose for removing admixtures of dust from the inspired air has been investigated a number of times recently; thus Aschenbrandt[1] investigated the subject first, then I followed,[2] and then E. Bloch.[3] It was found that a large part of the dust in the air was retained in the nose; but, as Bloch and myself have demonstrated, this removal of dust was not complete. The value of these investigations is, however, lessened by the fact that they have been carried on under conditions very much at variance with those existing naturally. In all cases the current of air was conducted into the nose of one side by a glass tube introduced into the corresponding nostril, led across the posterior nares and then made to escape by the opposite nostril. In the powder-experiments, which form the basis for this article, the natural relations have been preserved, and on the cadaver it was possible to observe the course of the powder into the trachea. Thus it becomes possible to say which parts of the nose are responsible for the filtering qualities and which parts receive the deposit of dust. Bloch considered the physical properties of the nose in their relation to the retention of dust, and there can be no doubt that these are significant factors. It is also evident that narrowness and moisture in the nasal cavity are also of importance. But in addition, my experiments prove the significance of the direction of the current upon this question. The curved course in an upward direction materially increases the capacity of the nose for retaining dust. The influence of this factor can be demonstrated by a simple physical experiment. In order to show the dust which was carried along by a stream of air, I made use of a short rubber tube whose opening was partially closed by a strip of paper fastened across it; the strip of paper and the circumference of the small

[1] "Die Bedeutung der Nase für die Athmung," von Dr. T. Aschenbrandt, Würzburg, 1886.

[2] *L. c.*

[3] Physiological Investigations of Nasal Respiration, by E. Bloch. No. 4, vol. xvii. of THESE ARCHIVES.

tube were blackened so that the deposit of powder could be demonstrated up these parts either by the naked eye or with the use of a lens. The accompanying schematic drawing gives an approximate illustration of such an experimental rubber tube placed within a larger glass tube.



a is the external glass tube; *b* the smaller rubber tube placed within the posterior end of *a*; *c* is the blackened strip of paper. Tube *a*, the level of the external opening of which is vertical, is connected with an aspiration-bottle by means of a rubber tube applied over the posterior opening *o'*; 5 litres of air are drawn through every 20 or 30 seconds, clouds of magnesia dust being produced in front of the opening *o*; the smaller internal tube is about 20 *cm* from *o*; there will be a very marked deposit of magnesia powder upon the strip of paper and upon the circumference of the extremity of this smaller tube *b*. If the opening *o* be then closed and a round opening *u* of similar size be made on the lower surface of the glass tube *a*, and the same experiment be repeated, the tube *b* will present considerably less deposit of powder, whilst a considerable quantity will be found upon the roof of tube *a* just behind the opening *u*.

In passing from the exterior to the windpipe, the current of air changes its course twice: first, when it enters the nose; and again, upon reaching the pharynx. In both of these situations, as a matter of fact, dust is deposited in considerable quantities. Beyond the trachea we find further interruptions in the course of the current of air at every subdivision of the bronchi. In this way the removal of particles of dust is favored, and the lengthy, narrow, and interrupted form of the respiratory tract represents a very important factor in guarding the lungs from the effects of

dust. These attributes serve to filter the air for the lungs just as they are of value in moistening and warming it (see my article mentioned above). If, on the cadaver, the trachea be connected with a glass tube, the extremity of which has been provided with one of the smaller experimental tubes already described, it will be surprising how very little of the magnesia powder will be deposited upon the small inner tube in conducting the powder-experiment. If flour be employed instead of magnesia no deposit whatever will be found upon the tube, provided, of course, the air has passed through the nose and trachea. It is obvious, therefore, that respiration of dust-laden air would have to be long continued in order to allow particles to reach the lungs. It must also be evident that the expired air which has been compelled to traverse the indirect route in an opposite direction, must be almost absolutely free from dust; this was demonstrated many years ago by Tyndall,[1] though Renk[2] claims having had different results after using more exact methods.

I have also investigated to what extent the filtering property of the nose is more complete than that of the mouth. I employed the powder-experiment on the cadaver in two ways: first, I closed the mouth effectually by stitches and plaster and conducted the air through the nose; and then I passed the air through the mouth, having occluded the nose. It was found that even when dust-laden air was passed through the mouth very little of this dust reached the trachea, especially if the mouth were kept half open so that the upper surface of the tongue approached very closely to the hard and soft palate; these surfaces then presented an abundant deposit. It is only when the mouth is widely open, and a great distance exists between the tongue and the roof of the mouth, so that the pharynx becomes visible, that much dust reaches the trachea, though considerable is deposited upon the walls of the pharynx. In all these experiments it was shown that with a slowing of aspiration the deposit of dust became more perfect. I found also, that,

[1] "Fragmente aus den Naturwissenschaften," von J. Tyndall, Braunschweig, 1874.

[2] Die Luft, von Dr. F. Renk. "Handbuch der Hygiene," I. Th., II. Abth., II. Heft., Leipzig, 1886.

whether the air passed through the nose or through the mouth, more dust reached the trachea when the head of the cadaver was placed horizontal than when in a vertical position corresponding to the erect posture. This may explain why special danger attaches to sleeping in an atmosphere rich in dust or laden with germs of infection.

In the description of the fundamental powder-experiment already given, it is stated that the powder is deposited in marked quantities in two situations in the nose: on the anterior, inferior portion of the septum, and on the anterior edge of the middle turbinated body. If we apply the results of the magnesia powder to the germs of infection, these two spots would seem specially exposed; as regards the septum, this is confirmed by the experience that perforations, especially those of non-specific, tuberculous nature, mostly affect the lower anterior portion of the septum.

In addition, it is worthy of note, that in ozæna, in the production of which the influence of external micro-organisms seems probable, we find that in recent cases, especially in children, in which the atrophy has not yet become marked nor the formation of crusts extensive, the first crusts are always and exclusively found upon the septum and the margin of the middle turbinated body. It certainly seems remarkable to me that the nose and the first portions of the respiratory tract, in which the carriers of infection contained in the air—especially tubercle bacilli, are first deposited, should be attacked so seldom by tuberculosis, especially of the primary form, and that in operative wounds suppuration, etc., is seen so seldom in these situations. Of course by the ciliary motion, discharge of secretions, and by reflex and voluntary cleansing, small foreign particles may easily be removed, especially from the nose; but whether these protective provisions are sufficient to explain the immunity of the nose and the beginning of the respiratory tract, seems doubtful to me and invites further investigation.

In conclusion I beg to express my thanks to Prof. Haase, director of the Anatomical Institute at Breslau, for his kindness in placing the heads of cadavers at my disposal, and for the interest which he showed in my investigations.

BONY GROWTHS IN THE MEATUS AND THEIR REMOVAL.

By URBAN PRITCHARD.

MUCH discussion has arisen not only in respect to the etiology but also as to the appropriate treatment of bony outgrowths of the external auditory meatus, and the difficulties and dangers of the operative methods at present in vogue have led many of us to hesitate before advising our patients to submit to surgical interference. In this communication I propose to indicate the plans which I have myself found most useful in dealing with the different varieties of these outgrowths, and more especially to point out a slight modification of the method of drilling, which appears to me to obviate many of the disadvantages under which the use of the drill at present labors.

The late Dr. Cassells, of Glasgow, introduced a primary broad classification of the bony outgrowths of the meatus. He divided such growths into hyperostoses and exostoses proper.

By hyperostosis we understand a diffuse enlargement of bony tissue, the result more particularly of chronic inflammation. This outgrowth usually presents itself in the shape of a comparatively large but uniform swelling of one side of the osseous wall of the meatus. It increases in size slowly (though more rapidly than true exostoses), and its growth may cease at almost any point, but very frequently it extends until the meatus is completely blocked, when it occasionally causes pain from pressure on the adjacent surfaces. Luckily such forms as this are very rare, and as they are but slightly denser than ordinary compact bone,

their removal is not so difficult as is the case with many of the exostoses proper, to which I am about to refer.

The exostoses proper may be grouped under three chief heads, viz.:

I. Multiple; uniformly smooth and rounded; pale and glistening on the surface; even denser than ivory in consistence.

The etiology of these formations is obscure. Bathing, syphilis, and many other causes have been assigned for their appearance, but, as far as my own observations go, I am inclined to the belief that they are usually of gouty or perhaps rheumatic origin, more especially as they are seldom met with in hospital patients, but in the well-to-do and those suffering from gouty diathesis; hence their occurrence varies a good deal with nationality, and hence also, perhaps, the reason why Englishmen are particularly prone to this disease. It must be admitted, too, that frequent bathing appears to act as an exciting cause.

In size they may vary from that of a millet seed to that of a split pea. Their growth is extremely slow, and it is but seldom that the meatus is found completely occluded by them, for directly opposing exostoses come in contact with one another their growth appears to be arrested. Thus a chink is always left which would be ample for ordinary hearing purposes, were it not frequently liable to become obstructed by the accumulation of débris (epidermic scales and cerumen), and hence it is that deafness is complained of.

II. Multiple; irregular in shape; of pale pinkish hue and dull appearance, with broad bases, and of great density.

For the most part, the origin of these may be traced directly to the irritative action of old-standing otorrhœa, or even to the actual ossification of polypi. They increase in size but slowly, though probably their growth is rather more rapid than those of the first class, especially as long as the otorrhœa remains unchecked, and hence they may occasionally be met with completely occluding the meatus—a condition, of course, of considerable and obvious gravity.

III. Single polypoid exostoses, consisting of a nucleus, so to speak, of ivory-like consistence, from the surface of which

trabeculæ of cancellated bone project into a layer of fibrous tissue, the whole being attached to the outer edge of the ossous meatus by a bony pedicle.

These would seem almost invariably to be the result of ossification occurring in a fibrous or fibro-cartilaginous tumor.

Though very rare, their tendency to comparatively rapid enlargement is an important element in considering their treatment.

There is usually but little difficulty in determining the nature of bony growths. At first sight they may be mistaken for simple polypi, but even this error is scarcely possible to the practised eye, and the use of the probe will quickly reveal their osseous character. It is, however, of importance that an accurate differential diagnosis of the several varieties should also be made, and we must therefore observe carefully the characteristics of the growths as described above; in addition, it may be noted that exostoses of the first and the second class are usually very tender when touched with the probe, while the surface of those of the third class is not only soft and yielding but almost insensitive.

It may be as well to mention incidentally that multiple exostoses (first and second varieties) are by no means confined to the meatus; they may occur in the bony walls of the middle ear, and, of course, may then seriously interfere with the functions of that portion of the apparatus, and produce irremediable deafness.

I have dwelt at some length upon the classification and differential diagnosis of these bodies, because the line of treatment to be adopted in each case varies considerably with the nature, position, and shape of the growth with which we are called upon to deal.

The question of treatment resolves itself mainly into one of operation, and we have to decide not only *when* surgical interference should be undertaken, but also *how* it can best be carried out.

Hyperostoses, on account chiefly of their size and their rapid and uniform growth, are usually not seen until suffi-

ciently large to block the meatus, when, of course, they should, except in rare instances, be removed at once.

Exostoses of the first variety ought, as a rule, to be left alone, the occasional removal of débris being all that is necessary. But if there is any tendency to complete occlusion, surgical interference is called for. An exception should be made in favor of those cases, with which we occasionally meet, where one of the growths is much larger and more prominent than the others, as there is then a tendency to continued growth and future occlusion. More especially should these latter be removed early if they are situated in the outer part of the osseous meatus.

In the second variety, as in the first, surgical interference is advisable under similar conditions—*i. e.*, when there is any danger of occlusion of the meatus, and in cases of single upstanding exostoses in the outer part of the passage. Not only so, but on account of the frequent presence of otorrhœa in these cases, occlusion is very liable to occur; for a very slight degree of obstruction may suffice to check or entirely to prevent the free flow of the discharge, and this is more especially the case on the recurrence of any inflammation. We must likewise remember that this otorrhœa is often but a sign of carious disease existing behind the exostosis, when, of course, an operation becomes imperative.

It follows, therefore, that the removal of this variety of outgrowth is far more frequently necessary than is the case with the first class.

Exostoses of the third variety should, as a rule, be removed at once, for the operation is, comparatively speaking, a trifling one, and there is therefore no necessity for delay by which, on the contrary, the difficulties of the operation may be increased.

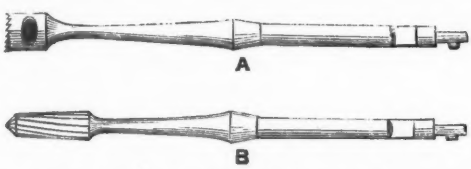
I now come to the consideration of the methods to be employed in the removal of these growths.

The chisel and hammer are occasionally very useful, but I think myself that they are chiefly applicable to cases of hyperostosis, when the bone is comparatively soft and the extent of surface to be attacked relatively large. The curve of the chisel or gouge employed should as far as possible be that of the external meatus.

Exostoses of the third variety, having a narrow base or pedicle, are easily removed by means of the dental elevator, or, as suggested by Mr. Field, they may be broken off with a pair of dental stump-forceps.

By far the most usual method of removing aural exostoses, especially those of the first and second class, is by means of a modified dental drill or burr; this may be worked, as proposed by Sir William Dalby, by the electromotor, or, as is perhaps preferable, by the dental engine.

The burrs employed (Fig. B.) should be of fine temper and



A, Trephine; B, Drill (medium), used for the removal of exostoses; exact size.

very sharp, and rather longer in the shank than those used by dentists; an assistant (if possible a dentist) should undertake the working of the motor.

If a single growth has to be removed, the drill should be applied as far away from the base and as near the apex as possible. Commencing with a very fine drill, when once the head has buried itself in the growth, we may exchange it for one of larger size, until at length the action is simply that of a rotatory file working in a furrow or groove. In some cases, the juxtaposition of two or more exostoses in itself forms a groove, in which the drill may be inserted, and the filing process commenced from the surface.

Recent improvements in the manufacture of burrs has, no doubt, greatly facilitated these operations, but in spite of this they are by no means easy, or to be undertaken lightly. They are frequently very tedious, and more than one sitting may be called for. This is partly due to the blood, which so quickly accumulates in the narrowed meatus, obstructing the view, and necessitating the frequent removal of the drill, and partly to the density of the growth itself; on this latter account, too, the burrs are particularly liable to slip or run off the surface of the tumor, and, in fact, until the head of

the drill is well buried in the tissues we can never be certain that this will not occur.

By the following plan I think I have succeeded in obviating some of the difficulties attendant upon the use of the simple drill.

Instead of a solid burr, I have, in some of my more recent cases, made use of a minute trephine (Fig. A, p. 49) similar to those occasionally used by dentists. It differs from the ordinary surgical trephine not only in respect to its size, but also in the absence of the central peg or tooth. Various sizes can of course be made, the one represented being about 5 *mm* in diameter.

Substituting this instrument for the burr in the dental engine, the method of using it is simply as follows, viz.: As large a trephine as possible is selected, and it is applied as near the base as will permit the circumference of the instrument to rotate freely above the apex of the growth, so that at any one moment only a portion of the circumference of the trephine is in actual contact with the tumor; the object being to cut off a portion of the growth rather than to make a hole in it.

The cases in which this method is more distinctly applicable are those where one growth is decidedly more prominent than the others, and these are precisely the cases in which we are most frequently called upon to operate. On the other hand, when the object is simply to enlarge a pre-existing though narrow opening between several exostoses, the solid drill is to be preferred.

The advantages of the trephine over the drill seem to me to be:

1st. As a rule, only one sitting is necessary, for it will be at once perceived that to all intents and purposes this plan is merely a sawing through of the base of the tumor, and while this need take no longer than drilling a single hole, a far larger portion of bone is removed.

2d. There is much less trouble from the slipping or running of the instrument on the surface of the growth, and even if it does so, there is less risk to the meatus, as the trephine, unlike the drill, is perfectly smooth on the outside.

3d. No delay is caused by the change of instruments; the same trephine will last throughout.

4th. Whereas with the drill nearly the whole growth has to be filed away or converted into débris, with the trephine there is obviously relatively less débris and therefore less need for removing and re-applying the instrument.

5th. For the same reason, there is less blood and therefore less obstruction to the view.

The results of these operations are as a rule highly satisfactory. As might be expected, large unhealthy granulations occasionally crop up at the edges of the injured surface, but these usually yield quite readily to the simplest treatment, and the wound heals satisfactorily. After removal of exostoses of the third variety, it will generally be found necessary, for the complete restoration of hearing, to syringe away a mass of epidermic scales, which will be found to have accumulated behind the growth. In this variety, too, I have occasionally observed that the pedicle arises from a cartilaginous surface, and this, to some extent at any rate, may account for the fact that they are exceedingly prone to recur, while the other bony outgrowths which I have described show little or no tendency to recurrence.

In conclusion, I may perhaps say a few words as to the use of anæsthetics in these cases. Many of these growths are exceedingly tender, and hence an anæsthetic is, for the patient's sake, absolutely necessary. Not only so, but as the slightest movement of the head may lead to most serious consequences, a general anæsthetic should be given in preference to such local applications as cocaine, for as the meatus is lined with skin and not mucous membrane, the mere application of this reagent has little or no effect, while the situation and extreme tenderness of the tumor forbid subcutaneous injections. The tenderness of the growth, too, appears to be almost completely limited to the outer surface, and, therefore, when once this tender region has been passed through the degree of anæsthesia need not be very profound, though I prefer myself to have the patient gently under its influence the whole time in case of undue movement or possible accident.

HISTOLOGICAL AND BACTERIAL INVESTIGATIONS OF MIDDLE-EAR DISEASE IN THE VARIOUS TYPES OF DIPHTHERIA.

Read at the 62d meeting of the German Society of Naturalists and Physicians.
(With thirteen figures on Plates V. to XII.)

By Prof. MOOS, of Heidelberg.

Translated by Dr. Jas. A. Spalding, Portland, Me.

THE question whether the primary and the so-called scarlatinal diphtheria are to be regarded as one and the same morbid process has of late been discussed anew, and as usual the most varying opinions have come to light. Fox is the most radical of all[1] in asserting that scarlatina, diphtheria, and tonsillitis are all one and the same morbid process, varying alone in the greater or less extensive propagation of the virus throughout the entire system. This view seems probable enough when we consider the percentage of the frequency of the secondary degenerative neuritis associated with these affections. This neuritis is most frequently observed after primary pharyngeal diphtheria. It has lately been denied as a sequel to scarlatinal diphtheria, but it has also as lately been observed by Seifert, and after angina, by Kast.[2] The latter cites at the end of his article the observations published forty years ago by French authorities concerning generalized paralyses after angina of non-diphtheritic origin. And Kurth[3] discovered the streptococcus in four cases of tonsillitis.

[1] *Lancet*, 1886, July 31st.
[2] *Cbl. f. d. med. Wiss.*, 1889, No. 1, and *Deutsch. Archiv f. klin. Med.*, Band xl., p. 41.
[3] *Berlin. med. Wochensch.*, 1889, No. 45.

On the other hand, many of our clinicians and pediatrists follow the leadership of Henoch[1] and accept the opinion that scarlatinal diphtheria is totally independent of the simple form of diphtheria. And Filatow has shown this in detail in the *Arch. f. Kinderkrankheiten*, 1887, p. 43. This topic has also been illuminated by a pathologist from another point of view: "The ear, according to Billington,[2] is never affected in genuine diphtheria, but only as a result of scarlatina. He regards the distinction as so marked that he considers it a differential diagnostic point. He was able to refer to its scarlatinal origin an otitis appearing with diphtheria." Roosa agrees with this opinion by saying that diphtheria with a scarlatinal origin is the only form in which otitis is observed, but later, in the etiology of acute middle-ear suppuration, he curiously separates the two types when he says that "scarlatina, diphtheria, croup, and so forth, here play an important rôle." Politzer also remarks ("Lehrbuch," 2te Auf., p. 324) that primary pharyngeal diphtheria is rarely connected with diseases of the ear.

It would thus seem as if Billington went too far, opposing pathological anatomy and clinical observation. All that we can say is that the primary pharyngeal diphtheria *is more rarely* complicated with diseases of the middle ear than scarlatinal diphtheria. Wreden saw[3] eighteen cases of diphtheritic inflammation of the middle ear which occurred in scarlatina complicated with diphtheria of the naso-pharyngeal space. We must also insist that in scarlatinal diphtheria, too, the aural affection is often bilateral, whilst in primary diphtheria of the pharynx the ear disease is generally unilateral, and that Politzer's panotitis is very rare in primary pharyngeal diphtheria.

Personally I have seen but one case in thirty years. Further still, when the aural affection is unilateral, as in the scar-

[1] Henoch has lately resumed the investigation of this topic (*Berl. klin. Wochenschr.*, 1889, No. 43), after seeing 192 cases of diphtheria. Genuine diphtheria is totally different from scarlatinal diphtheria or scarlatinal necrosis. But the first may combine with scarlatina, in which case we subsequently see paralysis of the velum, which is absent in scarlatinal necrosis. Bacteriology, according to Henoch, cannot be trusted in the diagnosis here, because the Klebs-Loeffler diphtheria bacilli have not yet certainly been isolated.

[2] Roosa: "Diseases of the Ear," German edition, p. 154.

[3] *Monatssch. f. Ohr.*, 1868, No. 10.

latinal form, the destruction is generally much more severe and the duration greater than in the primary. In reality though, the difference in frequency in the two affections is not so great as it seems. If I may be permitted to lay any stress upon the result of histological studies in several cases of this sort, I should say that a diphtheritic affection of the middle ear can persist a longer time without manifest symptoms, without suppuration, without perforation, and so forth. But the average duration in the fatal cases is only six days,[1] so that it happens that these cases are asserted not to have exhibited any ear disease.

The remarkable variations between scarlatinal otitis and that which originates after primary pharyngeal diphtheria led me to investigate histologically and bacteriologically the middle-ear alterations in the various forms of diphtheria, including the septic. At the same time I united therewith the investigation of the labyrinths affected, in order to verify and supplement my former papers on bacterial invasion of the labyrinth.

CASE 1. **Septic Diphtheria.**—E. G., a girl of five years; duration of attack, two days. Death after general constitutional toxic symptoms.

Anatomical Diagnosis.—Diphtheria of tonsils; croupous laryngo-tracheo-bronchitis; pneumonic infiltration of the left inferior lobe; fresh sero-hemorrhagic pleuritis, left side.

Right Temporal Bone: Meatus free; *Mt* dull; handle indistinct; tube open; periphery of *Mt* injected; the rest of the mucosa of the *entire* middle ear and ossicles dark red; dura in the petro-squamous fissure hyperæmic; Jacobson's anastomosis resembles a blue thread.

CASE 2. **Primary Diphtheria of Pharynx and Larynx.**—M. S., girl of five years. Duration, six days.

Anatomical Diagnosis.—Diphtheria; croupous tracheo-bronchitis; capillary bronchitis of left lobe; atelectasis of a portion of the lungs; fresh fibrinous double pleuritis.

Right Temporal Bone—Macroscopic Condition: Meatus filled with epithelium; *Mt*, serous infiltration; handle indistinct; tube

[1] Compare *Schmidt's Jahrb.*, ccxii., 1887.

injected; this condition extends to the periphery of the *Mt*, and then over the ossicles into the pneumatic spaces; the labyrinthine mucosa is also vividly injected as well as both fenestræ. Jacobson's anastomosis as in the previous case.

CASE 3. **Primary Diphtheria of Left Tonsil.**—Croup of upper and deeper air-passages. H. S., age three years, five months. Duration, eight days.

Anatomical Diagnosis.—Diphtheria of left tonsil; croupous laryngo-tracheo-bronchitis; broncho-pneumonia in right middle lobe; cheesy deposits in left upper and lower lobes; cheesy bronchial glands; ulcer of small intestines.

Right temporal bone: Meatus patent; *Mt*, serous infiltration; handle indistinct; mucosa of ossicles swollen; vessels of mucosa and labyrinthine wall engorged with blood, and a dirty coagulum in the jugular vein, an examination of which for micro-organisms had a negative result.

CASE 4.—**Scarlatinal Diphtheria.**—A. F., girl, age twenty-one months; scarlatina, naso-pharyngeal diphtheria, swelling of submaxillary glands; duration, five days.

Anatomical Diagnosis.—Scarlatina; diphtheritic inflammation with formation of pseudo-membranes in the naso-pharyngeal space and in the larynx, with partial necrosis of the mucosa; hyperæmia of lungs with enlargement of spleen, anæmia of kidneys, and moderate cerebral œdema.

Right temporal bone: Epithelial masses in meatus; *Mt* infiltrated, no perforation; tube normal; the entire mucosa injected, and thickened at the floor of tympanum.

Serum in the tympanum, engorged vessels in mucosa under the microscope, *to an extent that I have rarely observed, without the presence of a hemorrhagic extravasation.*

CASE 5.—**Scarlatinal Diphtheria.**—A girl of twenty-two months; the disease attacking mouth, lips, mucosa of cheek, tongue, and tonsils. Swelling of submaxillary glands. Duration, eighteen days.

Anatomical Diagnosis.—Scarlatina in the exfoliative stage; diphtheria with gangrene of tonsils; diphtheritic laryngitis; fibrinous perisplenitis, enlargement of spleen; numerous

embolisms of kidneys; acute gastro-enteritis; excessive hydrocephalus externus and internus, œdema of brain, and hemorrhagic pachymeningitis.

Left temporal bone: Meatus full of epithelium; *Mt* concave, greenish-yellow; tube, tympanum, and antrum filled with a mass of epithelium, blood corpuscles, and granular cells.

CASE 6.—**Scarlatinal Diphtheria, with a Relapse.**—S., a boy of seven, recovered from the first attack in six days, and was apparently well for eighteen days, when there was a relapse of DIPHTHERITIC TONSILLITIS AND PHARYNGITIS, with incarceration of the uvula between the swollen and diphtheritically coated tonsils.

Autopsy.—Acute parenchymatous nephritis; scirrhosis of liver; hypertrophy and dilatation of heart; hydrothorax hydropericardium, and incipient pneumonia; anæmia of brain; ulceration of tonsils; enlargement of spleen; hemorrhage into stomach and intestinal catarrh.

Right temporal bone: Mt infiltrated; mucosa thickened; cartilaginous tube necrotic.

Résumé.

The six patients were from two to seven years of age; three suffered from primary pharyngeal diphtheria, one case being of the septic type, and three from scarlatinal diphtheria. The duration was from two to eighteen days.

The macroscopic alterations can be summed up as follows:

Meatus, patent or filled with exfoliated epithelium.

Mt was not perforated in a single case. It was usually infiltrated with serum and dull; light spot and ossicles indistinct. The mucosa of the *Mt* in half of the cases was normal, in the rest somewhat injected; whilst that of the middle ear was pale in two cases and extensively swollen in the rest, particularly at the floor of the tympanum, and on the labyrinthine wall. The same was observed in the mucosa of the pneumatic spaces, and the cells of the mastoid process.

The tympanum was twice found full of fluid containing epithelium and granular cells, and Jacobson's anastomosis as well as the dura mater extending into the tympanum were considerably injected.

The tubes were patent, or only closed at both orifices with mucus, but in one case necrosis of the cartilaginous portion was noticed.

The histological alterations of the middle ear were caused by *micro-organisms;* viz., *micrococci* and *streptococci;* within the blood-vessels, free, or enclosed in leucocytes, in the middle of the lumen or along the wall, single or in groups, nuclear and without nuclei, and occasionally in the juice-spaces of the connective tissue (Figs. 1 and 2). This condition was even noticed in a case that terminated fatally on the second day.

The histological alterations in the mucosa of the labyrinthine wall are difficult to describe in their infinite variety, but it is worth mentioning that those at the floor of the tympanum and at the labyrinthine wall and its niches were more extensive than near the ostium tympanicum. This is especially marked in the epithelium, which is much more frequently mortified here than in the direction of the tube. This result is due to the immigration of the micro-organisms into the epithelial cells. It is probable that the cocci which have reached the tympanum owing to the ciliary movements of the tube wander as far as its posterior section, where they remain clinging to the niches in the mucosa.

Whilst most of the epithelial alterations are due to cocci that have directly immigrated thither, other alterations must be referred to microbes that have entered *indirectly*, partly through the bottom of the mucosa after destroying the epithelium, and partly by those that have migrated indirectly from the pharynx into the lymph currents, thence into the blood-vessels, and thence into the stroma of the mucosa. When united, they produce a constant action *visible from the second day.* We see the vessels engorged with blood, necrotic here and there, from microbic action, and as a result a subsequent hemorrhage. In Figs. 4 and 5 we see also a

meshwork of fibrin, filled with leucocytes, migratory cells, and many nucleated cells.

Part of the latter are at a later date transformed into *clumps of granules*, part break up into *detritus*, part succumb to a *hyaline degeneration*, and a part, finally, yield to a *colloid metamorphosis*.

Additional Alterations in the Tympanic Mucosa.

The epithelium of the regions near the periphery of the *Mt* is occasionally found *unaltered*, and upon it we discover an extensive infiltration of migratory cells, which lie either directly on the epithelium or on a fibrinous network beyond the epithelium, containing a few migratory cells. This meshwork does not terminate where the infiltration with migratory cells begins, but extends to the margin of the infiltration. Its fibres are occasionally interspersed with cocci.

The extensive infiltration nowhere reveals any histological signs of an advancing process, nor any tendency to suppuration.

Owing to their *constancy* in primary pharyngeal diphtheria but not in the scarlatinal form I will emphasize this fact: that the niche of the round window is invariably filled with *giant granule cells* and groups of *circular cells* with a small central, rarely eccentric nucleus, and *an abundance of larger round cells* with numerous small round nuclei, resembling those mentioned by Bizzosero[1] from a diphtheritic deposit in the spleen.

The Formation of a Pseudo-Membrane on the Mucosa of the Labyrinthine Wall was seen but once, and then in a child that had died on the fifth day from scarlatinal diphtheria. The membrane was visible to the naked eye, as a deposit $\frac{1}{3}$ *mm* thick. The microscope showed that the mucous epithelium was destroyed. The pseudo-membrane lay upon a thick cellular infiltration of the mucosa, a product of the reactive inflammation which precedes its exfoliation. Its general appearance is well shown with all the varieties of its components at Fig. 6.[2]

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[1] *Wiener med. Jahrb.*, 1876, p. 203.

[2] The pseudo-membrane was unfortunately destroyed by my lack of skill in carrying out Weigert's staining method, so that I can report nothing further concerning it.

Alterations on the Bony Labyrinthine Wall may become visible on the second day. First, in the shape of loss of periosteum, with its sequelæ, which may be regarded as an *indirect* result of the action of the bacilli; in other words, a disturbance of nutrition. Secondly, in a direct action upon the bone, destroying it by actually penetrating into the bone corpuscles (Figs. 1, 2, and 3). Thus do we find an explanation of the perforations inside the bony cochlear capsule, whilst the periosteum is intact. When, however, the periosteum is once destroyed the continued action of the bacteria can propagate the necrosis in the most varying directions, and, as Fig. 11 shows, even as far as the ligamentum spirale.

Alterations in the Intrinsic Muscles of the Ear.

After examining the stapedius and tensor tympani muscles for possible mycotic alterations, I concluded that the colloid and waxy degeneration which they exhibit is due to *thrombosis of the vessels* as well as to the *direct mycotic action* upon the contractile muscular substance. The thrombosis, with the consecutive necrosis of the muscular vessels that leads to numerous hemorrhages, is due to the transmigration of micro-organisms into the circulation, and is as much a disturbance of nutrition as the muscular degeneration of the tongue after ligation of the artery, or the total ligation of the organ itself. Now, just as in those experiments, so in diphtheria we find from the second day colloid and waxy degeneration of the muscular fibrillæ of the intrinsic muscles of the ear, and later granular degeneration with proliferation of the intra-fibrillar connective tissue. All of these various types may however be seen side by side (Figs. 9–12).

I have personally observed *direct mycotic alterations* from the presence of cocci in the periosteum of the stapedius canal, on the inside of the thrombosed muscular vessels, in the extravasated blood of the ruptured vessels, and in the muscular fibres themselves. Micro- as well as strepto-cocci are seen in the fibres that have already waxily degenerated. The sarcolemma granules are rarely increased in number, whilst their nuclei are shrivelled, or greatly enlarged and

very fatty. The transformed muscular fibres are generally widened, and terminate in a club-shaped nodule, and the waxy masses finally coalesce with one another in an amorphous mass (Fig. 12).[1]

Whenever an infectious disease like diphtheria terminates avo rably we must recall to mind these possible alterations in the intrinsic muscles of the ear, because they may have unfortunate sequences, so far as the hearing of the patient is concerned.

Alterations in the Nerves of the Middle Ear.

The canaliculi of the petrous bones of children through which the nerves of the plexus tympanicus pass showed defects in ossification, *due to mycotic degeneration.* The micro-organisms having wandered hither partly from the periosteum of the nerve canals, partly from the tympanum, through the defective portions in Schwann's and the medullary sheath, multiply their nuclei, and thicken the endoneurium, and finally destroy the medulla and entire nerve fibres by the development of granular cells and margarine. This process is chiefly marked in the facial and auditory nerves, and I intend to return to this subject at no late date.

The Condition and the Alterations in the Eustachian Tubes.

These are due to micro-organisms from the mucosa of the pharynx, no matter whether the diphtheritic process has produced necrosis or not. The immigration happens in two ways: either *directly* through the pharyngeal orifice, or *indirctly*, the micro-organisms pass through the juice-spaces of the connective tissue and so reach those fibres which pass between the cartilaginous fissures of the inner cartilage to the submucosa of the tube, as I once saw in the case of relapse after apparent recovery of eighteen days. Here there was necrosis of the lower part of the tube, destruction down

[1] Prof. Moos here adds a long note from Oertel's "Pathogenese der epidemischen Diphtherie," the chief point of which is that in the peritonsillar tissue in diphtheria the most important alterations are found in the muscular tissue in the form of hyaline degeneration of the muscular fibres.—S.

to the cartilage, and partial destruction of the cartilage itself. I also saw in the same region a large accumulation of micrococci and streptococci, which had entered through the connective tissue which runs from the cartilage to the submucosa. When the migration is *direct*, the cocci attain the tubal epithelium, and mortify it, or they wander into the glands and their cells, which soon necrose.

When necrosis does not ensue we find hardly any alterations but an infiltration of the mucosa with small cells, just as in the migration of tubercle bacilli into the deeper air passages, where the upper ones remain free and simply form the passage for those bacilli that are penetrating deeper.

Just here we may recall the dispute between Habermann and Baumgarten, the former asserting that the tubercle bacilli reach the tympanum chiefly through the tube, the latter by a roundabout tour through the blood-vessels. But I should say that *both are right*, though the two morbid processes are not alike in a clinical aspect. Thus in tuberculosis there are numerous compulsory movements, which undoubtedly force many bacilli toward the tympanum, whilst in diphtheria the tubal muscles are often paralyzed, and any forcible urging onward of the bacilli is impossible. This is one of the reasons why, in diphtheria, when associated with velar paralysis, fewer bacteria are found in the middle ear than in tuberculosis. To prove that in diphtheria the micro- and strepto-cocci originate *alone from the vessels*, we may cite the facts:

(1) That we see them very often in the white blood corpuscles within the vessels.

(2) Also in the stroma of the mucosa, where the epithelium has been largely preserved.

(3) And finally we find spots where the entire mucosa is preserved, excepting the deepest periosteal layer, which has been destroyed, a process that can be referred alone to the periosteal vessels, and not at all to migratory microorganisms.

The origin of the so-called primary-diphtheritic tympanic affections is somewhat similar. [No. 6 and 23 in the appended bibliography.]

The final question now is: *In what light are we to look at the middle-ear disease in these cases?* First, there is no suppuration[1] in the middle ear in five cases out of six, and even in the sixth the only suppuration was where the pseudo-membrane had rested. Hence the pus is not a part of an extended suppuration of the mucosa, but *only the product of a reactive inflammation* as on other mucous membranes, and additionally in purely croupous affections. *The affection is characterized by a partial mortification of the epithelium, an extensive infiltration of the mucosa with polymorphous migratory cells and retrograde metamorphosis, and finally by a necrosis of the blood-vessels and bone,* and all of this without the well-observed suppuration, as so often observed in primary and scarlatinal diphtheria with perforation of the *Mt.* The ultimate cause of these alterations has been recognized as *micro- and strepto-cocci.* Then too of a certain streptococcus, the S. Endocarditidis, we already know that it can produce necrosis without suppuration, and I have previously shown in cases of primary diphtheria that the streptococcus which wanders into the labyrinth can then and there excite extensive necrosis without a trace of suppuration.

Why it is, however, that in a large number of cases of middle-ear disease in primary pharyngeal,—though chiefly in scarlatinal diphtheria the well-known and often serious suppuration ensues, and why in others, as my observations show, there is no trace of the same, is still a matter of mere guesswork. The only thing sure is that the suppuration after scarlatina in the living often reveals the streptococcus either enclosed in cells or lying free between them.

Toward the end of the second week the streptococci begin to decrease in number; in the middle of the third week they are rarer, and basing my opinion on this condition, I was able to assert with confidence in a case of relapse of scarlatina after the sixteenth day, that the fever could not possibly be due to some complication arising from a suppressed otorrhœa.

[1] S. Hirsch, these ARCHIVES, vol. xix., p. 34, describes two cases of this sort with suppuration in the tube and tympanum, but the *Mt* was imperforate.

It is to be hoped that the future will enlighten us more on these points, and in the meanwhile the practitioner must not forget that even if the *Mt* is not perforated in diphtheria, serious alterations and even necrosis of the labyrinthine wall may nevertheless be present.

Historical Notes on Diphtheritic Bacteria.—I have already published my ideas[1] on the essential points in this respect in a paper on bacterial invasion of the labyrinth in diphtheria, where I stated that Loeffler had shown that there were but two sorts of diphtheritic bacteria demonstrable with our present staining methods—*micrococci forming chains*, and Klebs' *rods*, the former being *secondary* in their nature, whilst to Klebs' rods the essential significance in the disease itself was undoubtedly due.

Since then a large number of articles have appeared, of which I will now give a brief summary.

Loeffler[2] has demonstrated, in ten cases of genuine pharyngeal diphtheria, the constant presence of the rods in question. But he argues against its exclusiveness as a diphtheritic bacillus, because he additionally found "the diphtheria bacillus" in the mouth of a *healthy child*, and in diphtheritic membranes together with the diphtheria bacillus another that only differed from the former in its want of virulence in animals. Since then Hoffmann has proved[3] that Loeffler's diphtheria bacillus is a frequent, nay, almost constant, inhabiter of the pharyngeal mucus, but further still that the difference in the pathological condition according to which the diphtheria bacillus is very virulent to animals and the pseudo-diphtheritic bacillus is quite harmless, is not constant. And more than that, Hoffmann cultivated from the pharyngeal mucus of patients with scarlatina and measles (though free from diphtheria), and also from patients with phthisis, bacilli which partly corresponded to the virulent and partly to the non-virulent cultures of Loeffler's "diphtheria bacilli."

As Hoffmann further observed that virulent cultures partly or wholly lost their virulence after four weeks when left to

[1] These ARCHIVES, vol. xvii., p. 1.
[2] *Centralbl. f. Bact. und Parasitenkunde*, ii., pp. 107 and 352.
[3] *Wiener med. Wochensch.*, 1888, Nos. 3 and 4.

themselves, we must either agree that the diphtheria bacillus and the pseudo-bacillus are of *one and the same species*, with certain variations in form and growth, and a spontaneous alteration between an infectious and a non-infectious state, or that, despite their resemblances, *they are too different organisms.* Any absolute decision is impossible. There is, however, considerable probability that they are *identical*, and thus resemble other bacilli which vary in virulence from maximum malignity to complete innocuousness. Finally, the identity is apparently demonstrated by the *spontaneous* loss of virulence.

Baumgarten is inclined to think, however, that the nature of the diphtheritic contagion has not yet been discovered, and rather believes, on the whole, that the streptococcus pyogenes carries the virus. For it is often discovered in large masses in the fibrinous membranes and diphtheritic infiltrations, and in other internal organs, even without the addition of other microbes, and not only within the diseased zones of the mucosa, but beyond and outside of them in the adjacent deeper and apparently still healthy tissues.

Roux and Yersin [1] discovered, in fifteen cases, the Klebs-Loeffler micro-organisms, with all their characteristics, except that the bacilli were more virulent than in Loeffler's experiments. One half of a cubic centimetre of bouillon-cultivation injected beneath the skin of rabbits, guinea-pigs, and doves was rapidly fatal (thirty-six to sixty hours) in every case. *Only a few hours after the injection were sufficient to demonstrate the bacilli in the organs, but at death the micro-organisms had totally disappeared from the tissue*, and yet the disease pursues its lethal course despite the disappearance of the organisms that excite it. Again, Loeffler failed to produce experimental diphtheritic paralysis, but Roux and Yersin were more successful, exciting, by their injections, paralysis of the extremities, etc.

Kolisko and Paltauf [2] discovered Loeffler's bacillus in fifty cases of diphtheria in patients as well as on the cadaver, and only failed to find them in the later stages of the disease. Huebner, in order to avoid mistakes, removed from the very

[1] Contribution à l'Étude de la Diphthérie, *Ann. de l'Institut Pasteur*, No. 12, p. 629.

[2] *Wiener klin. Wochensch.*, 1889, No. 8.

locality of the disease at various stages and on various days the actual mucosa of the parts involved, and examined it with the greatest care. On the second day the loose exudate assumes the form of a croupous meshwork; on the third the thick croupous membrane is predominant; then we first meet with Loeffler's bacilli. On the next day the bacilli are still more abundant, and on the fifth day the mucosa has lost its epithelium. Kolisko also discovered the bacilli in croup, and for this reason regards diphtheria and croup as *etiologically* the same disease. *He did not find the bacilli in any cases of scarlatinal diphtheria.* The bacilli generally lie superficially; other forms, in chains, and grape-like, are deeper in the tissues. Kolisko's injections were not fatal, as like those of Roux and Yersin, but perhaps his cultivations were older. The fact that, even in sensitive animals, diphtheria is only a local disease, and that the animals die without exhibiting any extension of the disease to other organs, induced Kolisko and Paltauf to accept the theory that there is a diphtheritic virus, which, locally produced, acts on the whole organism, and especially perhaps on the vascular apparatus; a lesion of the mucosa is not indispensable. Genuine pharyngeal diphtheria and laryngeal croup are therefore a local infectious disease which lead on to intoxication, the occasional general infection being produced by the chain and grape-bunch cocci. The latter view may explain the absence of the specific diphtheritic bacillus in the cases which I examined.

The alterations in the middle ear in all of my six cases having been essentially alike, it seems as if they all alike must have been produced by the invasion of similar micro-organisms. And so far as Baumgarten's views in regard to the importance of the Strept. Pyogen. as exciters of the diphtheritic invasion are concerned, it is well to observe that many of the histological conditions entirely coincide with those in primary diphtheria, the fibrinous meshwork on the intact mucous epithelium, the formation of a pseudo-membrane, etc.

Septic Diphtheria.

Having shown that in the various forms of diphtheria the condition of affairs bacterially and histologically in diphthe-

ritic middle-ear disease do not differ from one another, we must insist that septic diphtheria differs from the other forms *by the more extensive propagation of the micro-organisms, and by the greater intensity of the morbid process.* And if I additionally consider the condition of the labyrinth, the enormous number of micro-organisms is amazing. Hence, correspondingly, in the septic form the thrombosis, the vascular necrosis, and the hemorrhages are more numerous, as well as the rapid and radical destruction of the cellular elements, and of the tissues. Then there is the alteration in the periosteum, and the colloid degeneration, and even the total destruction of the bone by the action of the micro-organisms. Finally we have the disorganization within the bone, produced by the invasion of the Haversian canals and of the bone itself.

SUPPLEMENTARY BIBLIOGRAPHY, MOSTLY UNUSED IN THE PRECEDING ARTICLE.

1. DETSCHY (*Wiener med. Wochensch.*, 1851, and cited in Urbantschitsch, "Lehrb.," 2 Aufl., p. 171) mentions a case of croupous inflammation of the tube.

2. WREDEN (*Monatssch. f. Ohrenhlkde.*, 2te Jahrg., No. 8) reports a diphtheritic membrane extending from the pharyngeal orifice to the isthmus.

3. WENDT (*Archiv f. Heilkde.*, Bd. xiii.) in five cases of croup and diphtheria in dead children saw nothing specific in the middle ear, the tube only once affected in croup and three times with suppurative inflammation.

4. SCHWARTZE (*Chirurg. Krankheiten d. Ohres.*, 1885) speaks only of suppurative catarrh of the tympanum in croup or diphtheria.

5. KUEPPER (*Arch. f. Ohrenhlkde.*, Bd. xi., p. 20) found one case of intact mucosa, in spite of extensive ulceration in pharynx and larynx, and one case of croup in the tube and tympanum also.

6. BURCKHARDT–MERIAN (*Volkmann's Sammlung*, No. 182) twice witnessed diphtheritic disease in the tympanum, although the tube was not attacked, and both were very painful.

7. KATZ (*Berl. klin. Wochensch.*, 1884). The violent pain, delirium, and fever often observed in the second week of scarlatina are due to inflammation of the middle ear.

8 and 9. The same author (*Deutsch. med. Wochensch.*, 1887, No. 48) has a paper on primary tympanic diphtheritis, and in the same magazine (October 1889, No. 41) a case of necrosis of the entire ear, and a second of necrosis of the middle ear and labyrinth, with streptococci in the tympanum.

10. STOCQUART (*Arch. f. Ohrenhlkde.*, Bd. xxii.) found in four cases of croup in children, under four years, pus in the tympanum, pseudo-membrane on the *Mt*, and once inflammation of the middle ear, with a pseudo-membrane on the ossicles and in the tube.

11. TRAUTMANN (*Arch. f. Ohrenhlkde.*, Bd. xiv.) describes a severe case of pharyngeal diphtheritis associated with diphtheritic inflammation in the tympanum, and micrococci on the mucosa where deprived of epithelium.

12. LORING (*Amer. Jour. of Otol.*, vol. iii., p. 126) has an article entitled "A Case of Death from Croupous Inflammation of the Middle Ear, with Acute Leptomeningitis of the Convexity"; pseudo-membrane, 1 *mm* thick.

13. MOOS (these ARCHIVES, vol. i., p. 628). Sudden hemorrhage in right *Mt* during angina diphtheritica.

14. MOOS (these ARCHIVES, vol. v., p. 271). Histological alterations in the labyrinth during toxic diseases; panotitis after scarlatina; death.

14A. MOOS and STEINBRÜGGE (these ARCHIVES, vol. xii., p. 254). Histological condition of six temporal bones from three fatal diphtheritic cases. Only one perforation. Tympanum with mucus, pus, or pus and blood; infiltration of mucosa; similar alterations in antrum and tube.

15. BEZOLD (*Arch. f. Ohrenhlkde.*, Bd. xxi.) describes the devastation due to scarlatinal otitis, with its disastrous effects on the hearing.

16. BLAU (*Deutsch. med. Wochensch.*, 1881, No. 49). Scarlatinal otitis, with a rare case of paralysis after pharyngeal scarlatina.

17. The same author describes (*Berlin. klin. Wochensch.*, 1881, No. 49) diphtheria of ear in scarlatinal disease, and a remarkable case of facial paralysis and diphtheria of both auricles.

18. VOSS (*Arch. f. Ohrenhlkde.*, Bd. xxvi., p. 231) treats of the connection between albuminuria in scarlatina and middle-ear disease.

19 and 20. WOLF (these ARCHIVES, vol. x., p. 234) refers the cause of exfoliation to the ossicles in 28 patients (18 due to scarlatina) to the extension of the scarlatina to the middle ear, and in these ARCHIVES, vol. xiv., pp. 137 and 149, he reports labyrinthine disease and panotitis due to scarlatinal diphtheria.

21. POLITZER ("Lehrb.," 2te Aufl., p. 325) says it is going too far to refer most of the severe cases of middle-ear suppuration to diphtheria, for he has personally witnessed middle-ear suppuration after scarlatina without a trace of diphtheria.

22. The same author has described ("Lehrb.," 2te Auf., p. 473) panotitis under similar circumstances.

23. GRUBER ("Lehrb.," 2te Auf., p. 471) suggests that there can be tympanic participation in pharyngeal diphtheria without a tubal trouble, or even when the diphtheria has terminated. The diagnosis must then depend on the localized pain and the fever. It may also happen that the characteristic products are developed on the mucosa of the inner tympanic wall, without any perforation of the *Mt.*

24. HUEBNER (*Volkmann's klin. Vortraege*, No. 422) speaks of the treatment of scarlatinal diphtheria.

25. SIEBENMANN (these ARCHIVES, Bd. xx.) found numerous micro-organisms in the tympanum of a patient with malignant scarlatina, *but failed to find them in the fat, fresh diphtheritic membrane of a mastoid cell*, and coincides with Huebner's view, that streptococcal development in the diphtheritic parts is due to subsequent migration from without (air and secretions), and therefore that it must be regarded as a secondary process, which has nothing to do with the etiology of diphtheria, but really signifies that septic infection has begun.

26. LEHNARTZ (*Jarb. f. Kinderheilkde.*, Bd. xxviii., p. 290) treats of the identity of the scarlatinal coccus with Fehleisen's erysipelas coccus. He has succeeded in inoculating mice with erysipelatous disease from the scarlatinal chain-coccus. He thinks that the identity is further proved by an observation of Huebner that an erysipelas was developed in Huebner's nostril by secretion coughed off from the throat of a scarlatinal child, and Huebner had never before had the erysipelas, or lately in any way come into contact with the same.

27. HOFFA, in speaking of the co-called surgical scarlatina (*Volkmann's Vortraege*, No. 292) asserts that he had cultivated from the blood of surgical scarlatinal patients streptococci which could not be distinguished from the Strept. Pyogen. and the Erysip. Cocci.

28. LEBER and WAGEMANN (*Graefe's Arch.*, Bd. xxxiv., p. 250) report a case of infantile necrosis of the conjunctiva, terminating fatally from multiple streptococcal invasion of the vessels.

29. BAUMGARTEN (Jahresb. u. d. Fortschritte i. d. Lehre. v. Micro-organismen., 1887) argues in favor of the view that the strept. pyogen. excites the diphtheritic affection.

Explanation of the Figures.

Fig. 1, Plates v. and vi.[1] Posterior section of the mucosa of the labyrinthine wall. Section 16. Sagittal section from a mucous indentation on the labyrinthine wall, in septic diphtheria of two days' duration. Case 1, Hartnack $\frac{1}{12}$, tube drawn.

K = bony labyrinthine wall with the periosteum, all the rest is the deepest layer of the mucosa lying next to the periosteum. The bony frame-work of the labyrinthine wall is altered in so far as the bone corpuscles are collapsed, and their former presence here and there indicated only by dark, occasionally wavy, lines.

The mucosa contains round, oval, spindle-shaped, and nucleated cells, as well as red and white blood corpuscles; numerous blood-vessels, the largest of which alone contain leucocytes, with cocci enclosed; most of the cocci are in groups within the lumen, or singly; only a few in the leucocytes themselves; generally on the wall, on the point of emigrating. A few cocci lie outside the vessels, most of them in [emigrated ?] cellular elements, and here or there in the juice-clefts (*S S*) of the connective tissue. Carbolated-fuchsin-alcohol preparation.

Fig. 2, Plates v. and vi. Sagittal section through a mucous pouch of the labyrinthine wall; series 65; crossing over from the posterior to the middle portion of the same case as Fig. 1; Hartnack $\frac{3}{4}$, tube dr. Carbolated fuchsin alcohol.

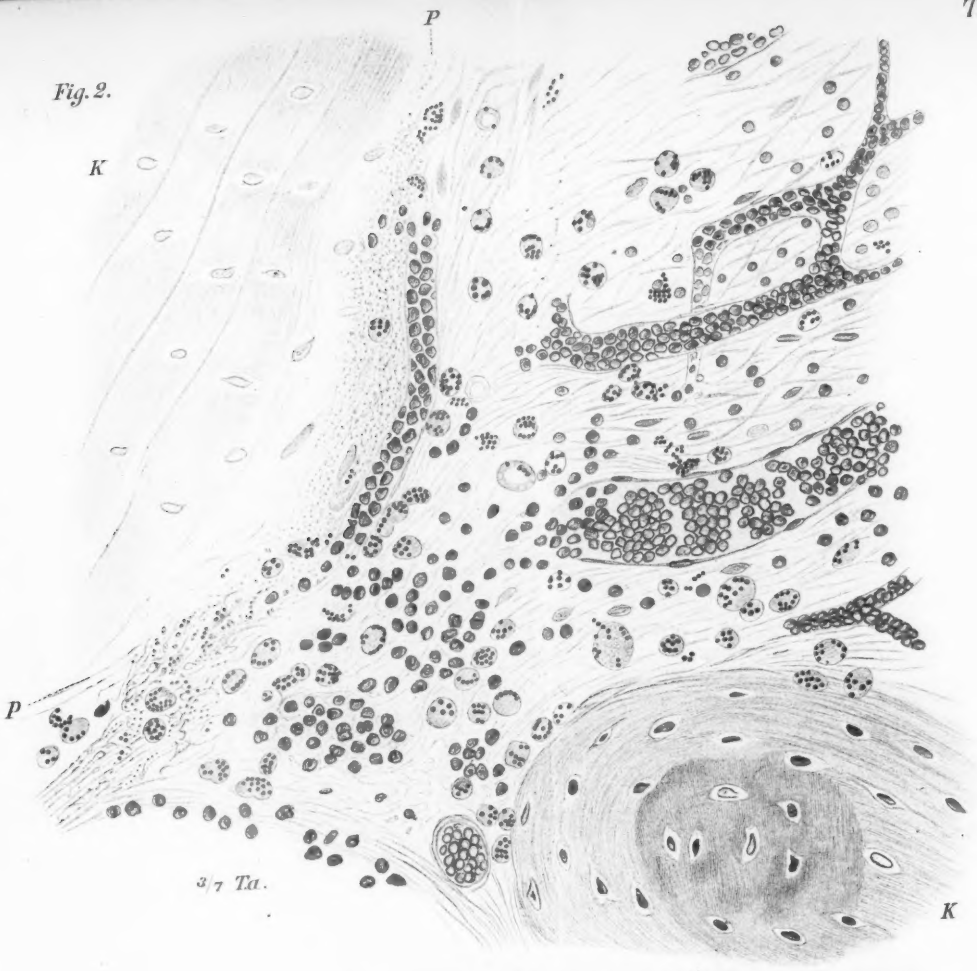
[1] The series of sections are made from the base to the summit of the petrous bone.

Fig. 1.

3/12 Ta.

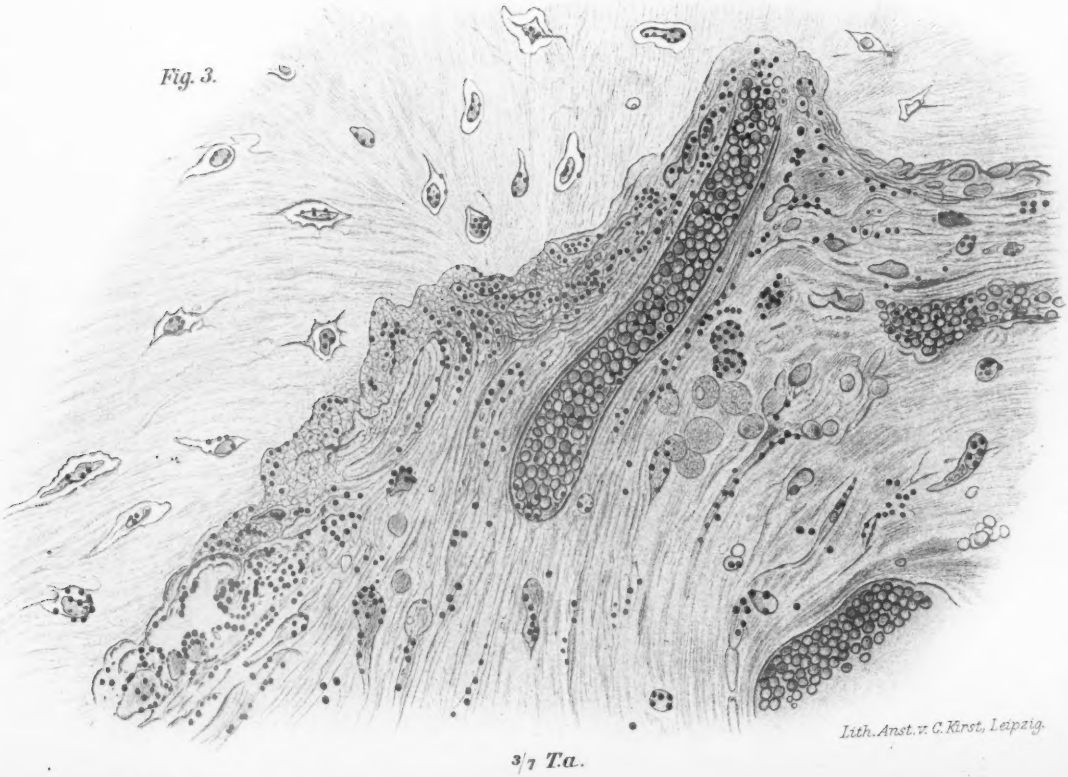
F. Veith. gez.

Fig. 2.



3/7 Ta.

Fig. 3.



Lith. Anst. v. C. Kirst, Leipzig.

3/7 Ta.

K = bone ; P = periosteum. All between the two bony portions is the pouch in the mucosa. We see blood-vessels partly necrosed, the emptied contents red, in the form of degenerated blood-vessels scattered over the mucosa. This exhibits, besides the connective-tissue fibres and corpuscles, cells of various forms and sizes enclosing streptococci, which lie also here and there free in the stroma and in the periosteum, which is degenerated. The upper layers of bone (to the left in the drawing) are already rarefied. The histological difference of the two bony parts (right and left) is very striking.

Fig. 3, Plates v. and vi. Sagittal section through the labyrinthine mucosa of the posterior segment of the tympanum in the preceding case ; series section No. 17, Hartnack $\frac{3}{7}$, tube dr.

Bone and the altered *deepest* layer of the mucosa. Amœboid cells of varying size and form, at one spot adjoining one another. Numerous cocci in the vessels, some enclosed, some free. Micro- and strepto-cocci are visible in the corroded bone, the stroma of which resembles connective tissue, poor in bone corpuscles, and most of these are altered and have lost their offshoots. A few cocci are visible inside the bone corpuscles, and the mucous stroma is thickened throughout, especially near the ragged bone.

Fig. 4, Plates vii. and viii. Sagittal section in posterior segment of labyrinthine wall, through the mucosa and adjoining bone. Scarlatina of five days' duration. Hartnack $\frac{3}{4}$, tube dr., Case 4.

A portion of the bone, K K, with the periosteum, P, and the deepest and middle layers of the mucosa, with vessels and meshwork, and beneath, an infiltration with various cells, of whose shape, etc., fig. 5 will give an idea. GL = fissures in the connective. C = a colloid focus.

Fig. 5, Plates vii. and viii. Shows the spot marked with an arrow in Fig. 4, with Hartnack $\frac{3}{7}$, tube dr. Hæmatoxylin preparation.

Between the meshes of a fibrinous network, a few leucocytes, mostly polymorphous, and migratory cells resembling giant cells. At *dK* a direct nuclear segmentation.

Fig. 6, Plates ix. and x. From the former case ; Hartnack $\frac{3}{8}$, tube dr., series No. 28 (picrocarmine staining). Pseudo-membrane from the rear of the mucosa of the labyrinthine wall, resting chiefly on a cellular infiltration of the mucosa. We see an extensive network of fibrin enclosing leucocytes and migratory cells. At *dK* cell nuclear segmentation. At *nb* a necrobiotic focus, *nc* neoplastic capillaries. To the left and above *nc* a thicker layer of

fibrin nearly metamorphosed into fibrin. Here and there extravasations, and above from *dK* a smaller extravasation and numerous blood corpuscles.

Fig. 7, Plates vii. and viii. Section from sagittal section through mucosa of labyrinthine wall; series No. 32, glycerine preparation, Hartnack $\frac{3}{4}$, tube dr. Primary diphtheria in a child of five years, Case 3.

Bone, *K*, with periosteum and mucosa; numerous blood corpuscles; in the middle a defect partly filled with colloid corpuscles, the latter covered or surrounded with blood corpuscles from the necrotic vessels.

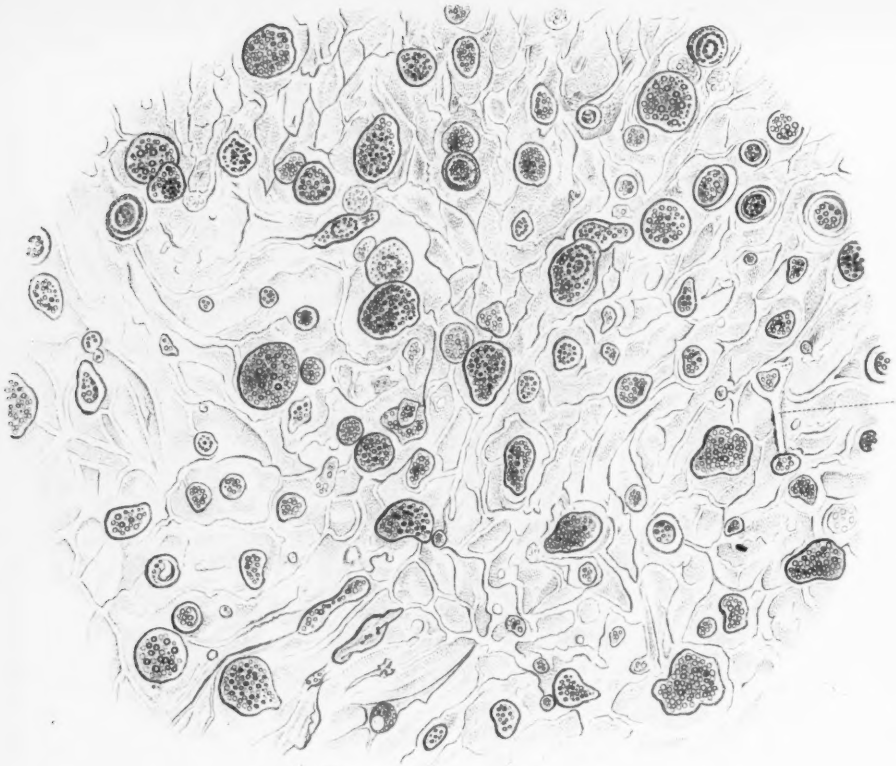
Fig. 8, Plates ix. and x. Section from a sagittal section of the mucosa from the posterior and lowermost part of the labyrinthine wall between promontory and floor of tympanum. Hartnack $\frac{4}{5}$, tube out. Scarlatina five days' duration, Case 4.

The upper portion only retains its epithelium intact; below, it is totally lost. Blood-vessels divided longitudinally and obliquely, tightly filled with blood. The mucosa above is transformed into a hyaline meshwork, beneath is thickened connective tissue without a trace of cells. Many leucocytes and vessels with thrombosis between the basal layer of the eipithelium and the upper border of the hyalinized mucosa, with here and there round or oval cells as depicted and described in Fig. 5. Directly above the anterior portion of the hyalinized mucosa are small apertures a small empty vessel, and numerous blood corpuscles. All of the section below the vessel running lengthwise is evidently the result of general destruction of the cellular elements. There is a cellular infiltration between the vessels, and above the connective-tissue stroma of the mucosa occasional empty cellular envelopes. Far in front toward the margin we see an irregular defect, which, to the right and farther inward, is bordered by a portion of the thickened mucosa. Finally, on the margin turned downward, we see at the inner half of the field heaps of leucocytes.

Fig. 9, Plates vii. and viii. Sagittal section through the stapedius muscle of the same case; Series No. 14, Hartnack $\frac{3}{4}$, tube dr. Glycerine preparation.

Some of the muscular fibres are normal, others, having lost their transverse striation, have a homogeneous, waxy look. Some fibrils show the various processes of alteration. A few sarcolemmatous nuclei, and at various spots proliferated intra-fibrillar connective tissue.

Fig. 5.



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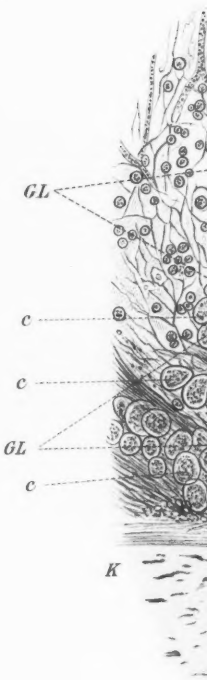
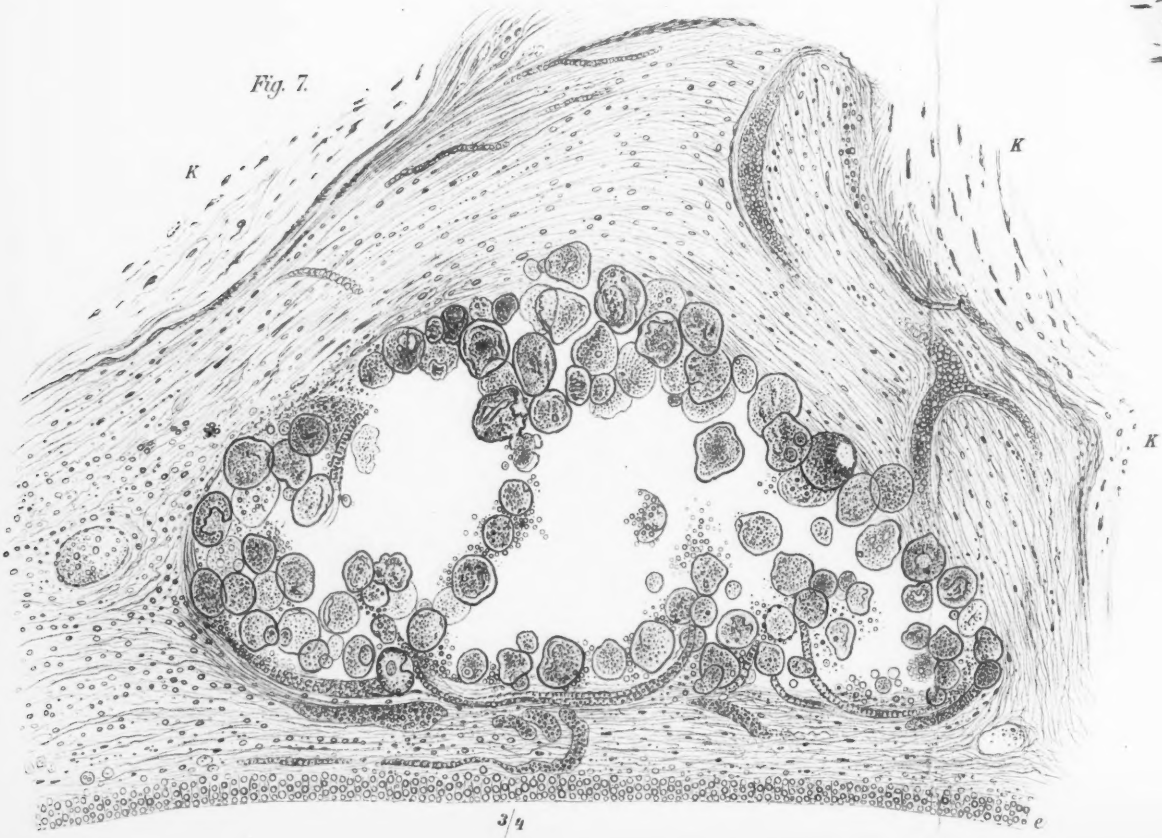


Fig. 7.



3/4

Fig. 4.

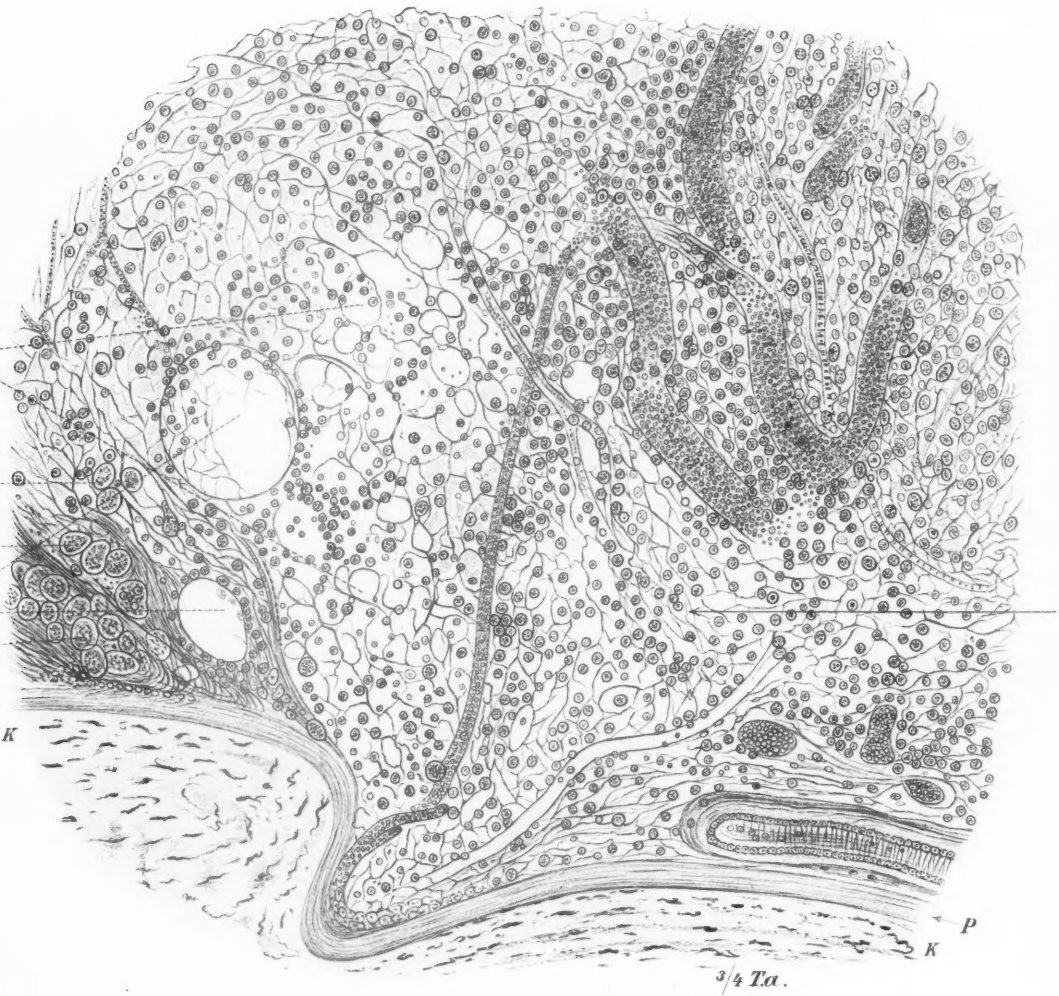


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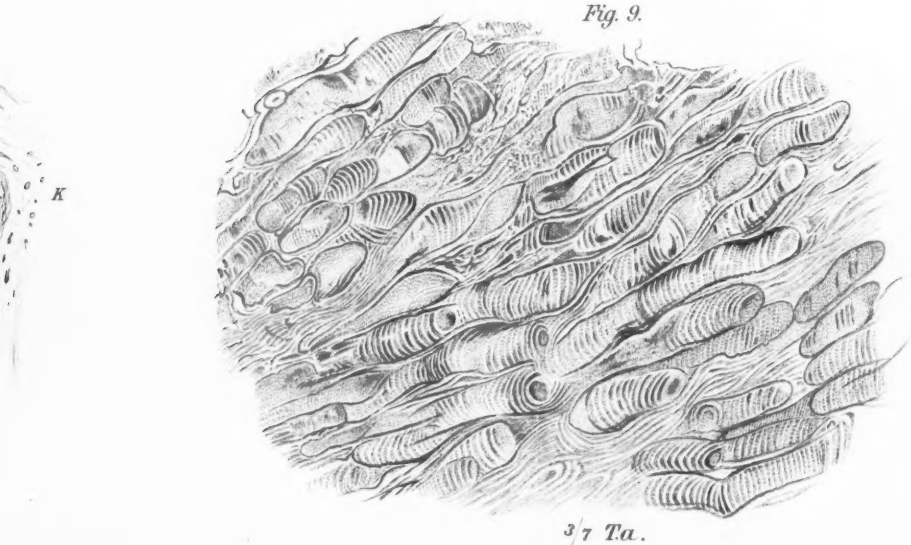
Fig. 9.



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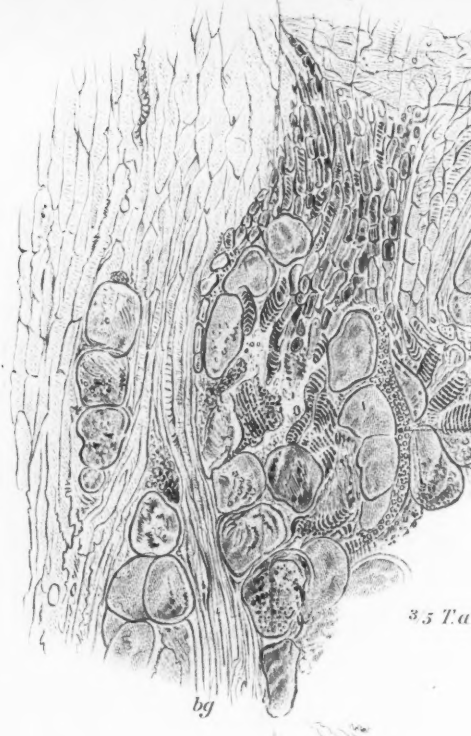
Lith. Anst. v. C. Kirst, Leipzig.

Fig. G.

35 T.a.

Fig. H.



35 T.a

F Voth. gez

3/5 T.a.

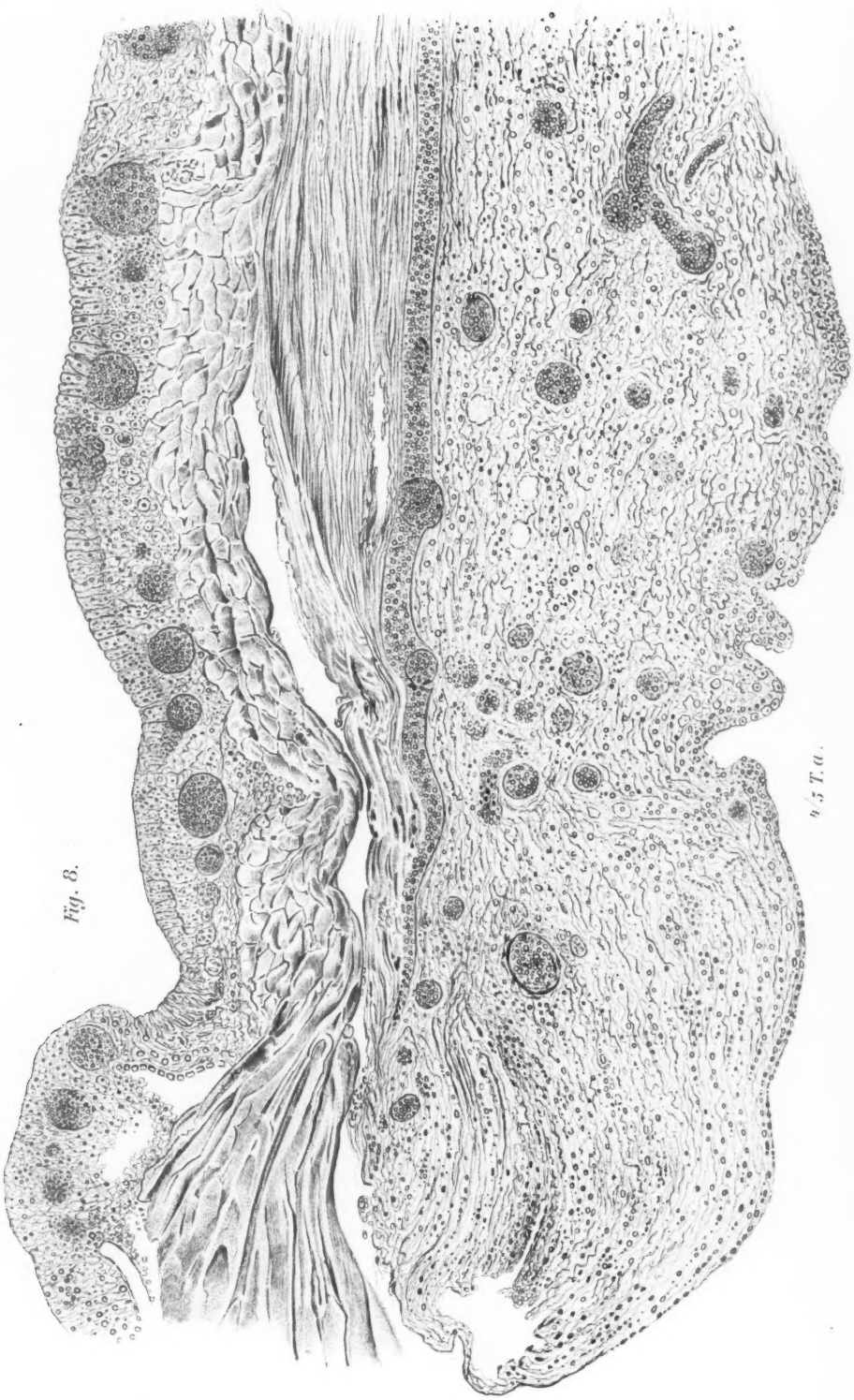


Fig. 8.

4/5 T.a.

Lith. Anst. v. C. Kirst, Leipzig.

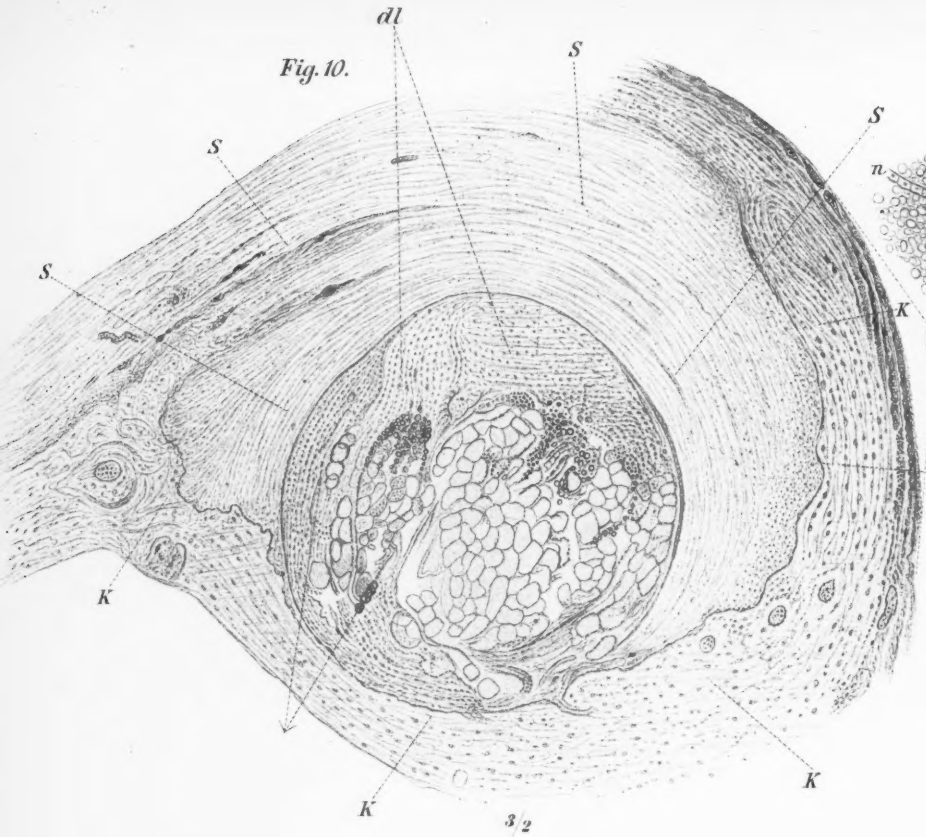
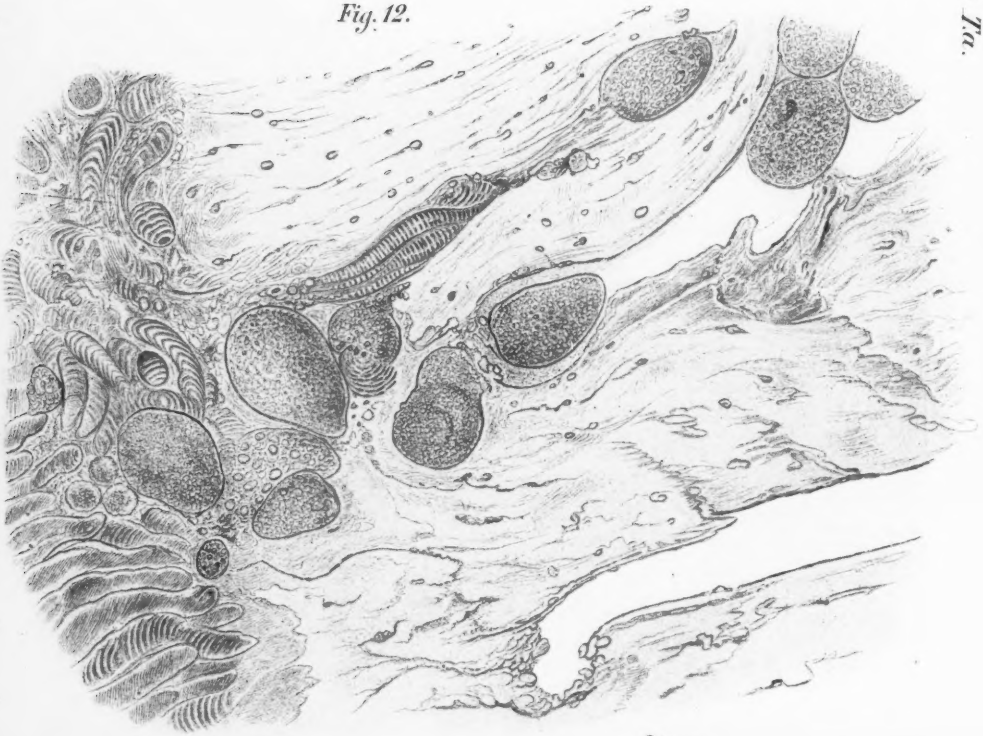


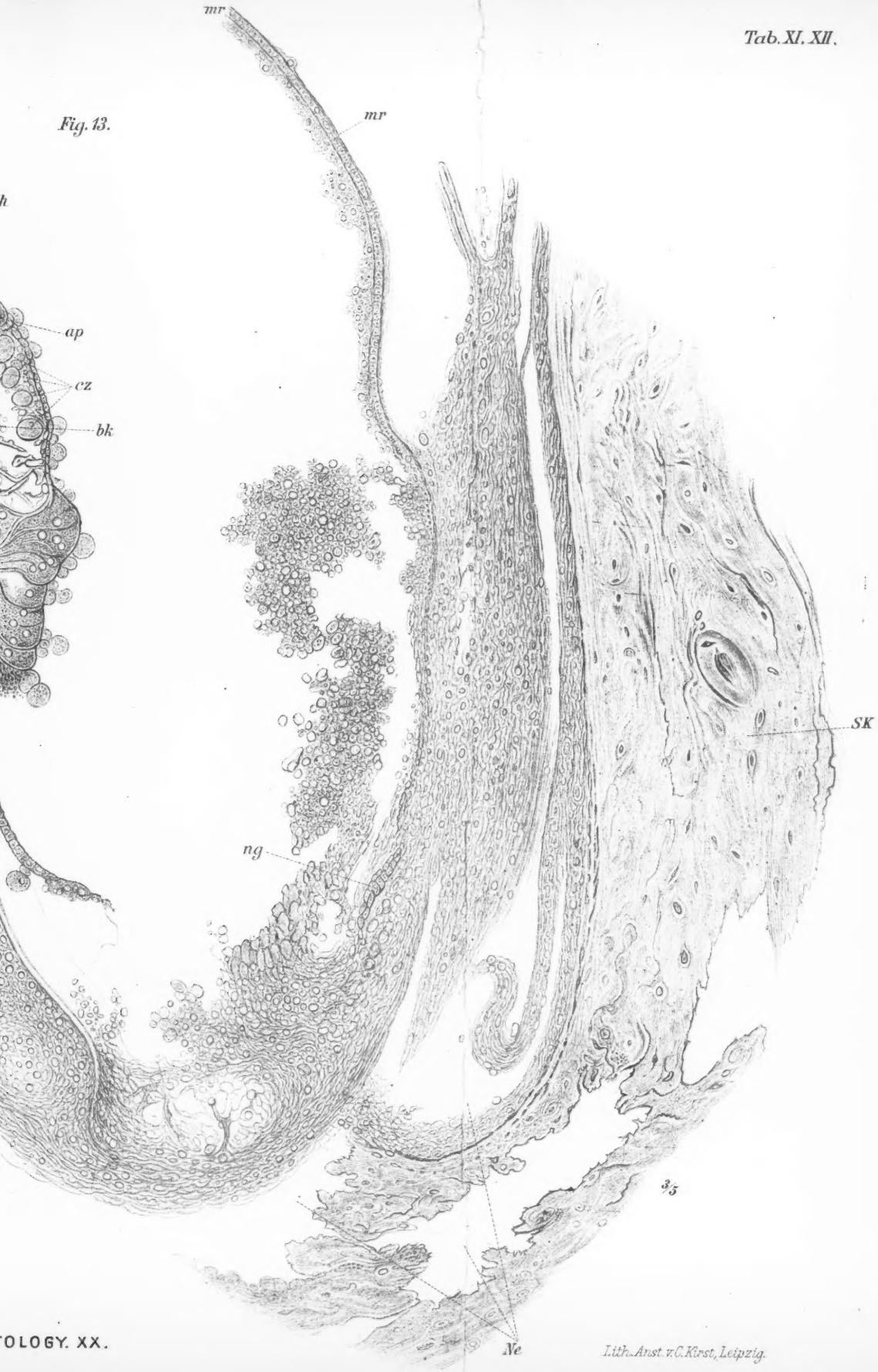
Fig. 10.

Fig. 12.



F. Veith gez.

Fig. 13.



Lith. Anst. v. C. Kirst, Leipzig.

Fig. 10, Plates xi. and xii. Sagittal section through the semi-canal for tensor tympani and the muscle; Hartnack $\frac{8}{3}$, tube null. Primary diphtheria, duration six days, Case 2. Glycerine preparation. *K* = bone; *p* = external periosteum; *I* = inner lining, membrane of the bony canal.

The inner almost circular part represents the divided muscle, with its various alterations. The centre of the field is mostly occupied with the primitive muscular fibres now in colloid transformation. The adjacent dark portions contain the fibres partly waxily degenerated, and partly still normal.

The dark oblique lines *(d l)* are partly artificial, due to the microtome.

The spot marked with an arrow is shown again in Fig. 11, Plates ix. and x.; Hartnack $\frac{3}{5}$, tube drawn.

Fig. 11, Plates ix. and x. We see many striated fibres, with colloid and waxy degeneration, the latter with retained sarcolemma. At *g* a thrombosed, necrotic, small blood-vessel; at *bg* proliferated connective tissue.

Fig. 12, Plates xi. and xii. Section 134; glycerine preparation of previous case Hartnack $\frac{3}{7}$, tube dr. Colloid and waxy degeneration of the tensor tympani, some remnants of the sarcolemma cylinders, and formation of fissures by destruction and resorption of the muscular tissue.

Fig. 13, Plates xi. and xii. Sagittal section through a part of cochlear capsule, the ligamentum spirale, and the structures of the ductus cochlearis of the apex convolution; Hartnack $\frac{8}{5}$, tube drawn out; section not precisely perpendicular; glycerine preparation from previous case.

A portion of the bony framework of the cochlear capsule *(SK)* has necrosed. This process extends from the labyrinthine wall to the ligamentum spirale. Several defects in the bone with irregular cavities. The periosteal layer of the ligamentum spirale is partly raised above the bone. Large gaps running up and down between the outer periosteal layer and the middle looser connective-tissue layer, and due to destruction of tissue. Only about one half of the middle layer of the ligament is preserved. Additionally a part of the inner layer and of the radiating layer of the ligament, and of the crista basilaris, with their vessels, are destroyed. At *ng* is the only vessel preserved, and that is partly necrotic. The stria vascularis and the vas prominens are also lost. The vessels have necrosed and poured

out their contents into the ductus cochlearis, where we see red and white corpuscles and cells.

As a result of these alterations, the ligament has lost its characteristic semilunar shape. *et* = labium tympanicum of the crista, with traces of the epithelium of the sulcus and cellular necrotic elements. *n* = nerve fibres passing toward the capillary cells. Most of the nerve fibres beneath the labium are covered with a hemorrhagic exudation, consisting of red blood corpuscles and débris, which, extending along the basilaris propria and covering its tympanal layer, press it backward so that instead of being straight it is now concave and then convex. The inner supporting fibres and capillary cells are destroyed, with the exception of a trifling remainder *(vish)*.

The inner pillar is defective in the centre. The head of the external pillar *(ap)* is altered into a cuplike structure, and its protoplasmic layer is lost. The inner half of the tunnel is filled with detritus, three structures of various forms, and an irregularly contoured cell with an eccentric nucleus. All of Corti's cells are preserved *(cz)*, but without hair pencils. Some of them resemble hyaline.

There are traces of the phalanges and basal processes of Deiters' cells. Most of the middle portion has been destroyed, and a portion of the free space thus produced is filled with red corpuscles *(bk)* and detritus.

All but the last supporting cells are preserved. A cluster of red corpuscles near the first supporting cell has pressed inward the basal process of the last Deiters' cell.

The contour of the membrana reticularis is remarkably irregular, and on it are several round and oval cell structures. The outer half of the sulcus spiralis has lost its epithelium, and all that remains is elevated and projects into the ductus cochlearis.

Reissner's membrane *(mr)* is covered on the side turned toward the ductus cochlearis with an occasionally broad and an occasionally narrow layer of cells, most of which, like their endothelial and epithelial investitures, are in a state of decomposition.

ON THE LOCAL USE OF MENTHOL AND OIL OF EUCALYPTUS IN AFFECTIONS OF THE MIDDLE EAR.

By Dr. ADOLPH BRONNER, of Bradford.

(*With one woodcut in the text.*)

A paper read before the Otological Section of the Society of Naturalists and Physicians at Heidelberg, September, 1889.

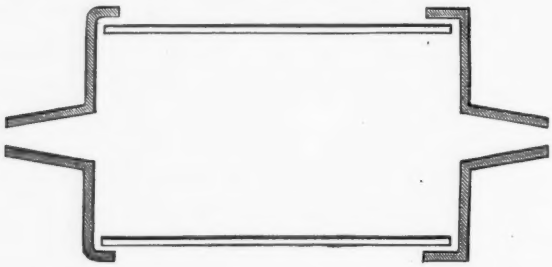
THE very favorable results obtained by Rosenberg and others with the use of menthol in the treatment of the diseases of the neck and pharynx induced me to try it in affections of the Eustachian tube and middle ear.

During the last year I have treated many cases, and a large percentage of these with apparent success. The most favorable cases seem to be those of chronic swelling of the mucosa, whilst in the initial stages of some cases of sclerosis I was inclined to think that I had been able to prevent the encroaches of the disease.

I will not, however, venture here to burden you with clinical reports and figures, but I should like to describe in brief the manner in which I use the menthol.

When the mucosa is greatly swollen, I direct the use of a snuff of boric acid with two per cent. of menthol to be frequently used in small quantities, while at the same time I inflate the middle ear with the catheter and menthol vapor. A few drops of a twenty per cent. solution of menthol in olive oil is poured into an antiseptic capsule, and this is then firmly fastened to the catheter. The capsule which I use resembles Hartmann's, only the glass tube is straight and not bulging. The capsule is then filled with pumice stone instead of cotton, and onto this the

liquid is poured. I generally use Lucae's modification of Politzer's bag, which consists of a double bag, that can be attached to the operator's coat. The capsule is then passed into the rubber tube between the hook and the bag.



The menthol vapor is slowly inflated into the tube for the space of a minute or two, and when the tube is obstructed by swelling of the mucosa at the orifice, it is interesting to watch with the otoscope how the passage gradually becomes more and more patent from the action of the menthol until finally the air rushes in with full force.

In case a bougie is needed, I dip the end of it into menthol oil, and let it remain a short time in the orifice of the tube before I urge it farther onward.

If the mucosa of the middle ear is excessively affected, especially in cases of sclerosis, I use in addition to the menthol the oil of eucalyptus poured similarly upon the pumice stone. The inflation is then continued about the same as before.

I lay great stress upon the *prolonged use* of the vapors upon the diseased mucosa, and I think that I can especially refer to this method the favorable results that I have obtained.

I do not remember to have produced any pain or inflammation from this procedure, and on the contrary I think that by the use of the menthol I have been able to relieve the slight occasional pain.

The menthol does not seem to be of any particular value in chronic otorrhœa.

I have used it considerably in cases of furunculosis of the meatus externus, but I am unable to testify to its advantages as extolled by Cholewa in this disagreeable affection.

In conclusion, I will call attention to the danger which we run in inflating the middle ear with impure air. There must be innumerable cases in which the exciters of inflammation have been

carried into the middle ear, and a simple catarrhal inflammation thus transformed into a purulent. Whether the micro-organisms in question are destroyed or hindered in their development by the menthol or eucalyptus I am quite unable to tell, because I made no culture experiments. But since I have employed menthol (and have treated a large number of cases) I have not seen a single case in which suppuration or pain were present after or during the treatment. But when I used unpurified air many cases of this sort were observed.

I will additionally suggest that lately, for the sake of greater security, I have added a second capsule filled with dry cotton and attached to the bag, and that by frequently changing the cotton I hope to prevent still more accurately the penetration of micro-organisms into the middle ear.

REPORT ON THE PROGRESS OF OTOLOGY DURING THE SECOND HALF OF THE YEAR 1889.

By A. HARTMANN, Berlin.

Translated by Dr. Max Toeplitz, New York.

III.—PATHOLOGY AND THERAPEUTICS.

GENERAL LITERATURE.

1. Prof. K. Bürkner. Report on the cases observed during the year 1888 to 1889 at the policlinic for aural diseases at Göttingen. *Arch. f. Ohrenheilk.*, vol. xxviii., p. 263.

2. Dr. Valentin. Hearing faculty of fever patients and diagnosis of unilateral deafness. *Schweizer Correspondenzbl.*, 1889, No. 18.

3. Prof. Dr. Kiesselbach. The action of cocainum muriaticum upon the ear. *Monatsschr. f. Ohrenheilk.*, etc., 1889, No. 9.

1. The number of patients treated during the time mentioned in the report at the policlinic at Göttingen was 1,281. The following modern remedies were tried : a. Aluminium acetico-tartaricum Athenstædt. Bürkner considers the drug to be extremely well adapted for the treatment of rhinitis hypertrophica and of all chronic nasal swellings. A five to ten per cent. solution of borated glycerin, however, has proven to be much more reliable. b. The disadvantages of creoline for the treatment of aural diseases preponderate over its advantages. c. The action of herba sabinæ together with alumen ustum for treatment after removal of polypi is not equal to cauterization with lapis.

2. Valentin has found that, with the rising of the temperature a diminution of the hearing power is invariably associated without perceptible lesion of the ear ; the decrease is in direct proportion with the increase of temperature. It was very distinct

in typhoid fever, rheumatism, wound fever, and tuberculosis. In hectic fevers of convalescents from typhoid fever and in tuberculosis the hearing is better during the remittent stage than during the fever. Chinin produces almost invariably hardness of hearing ; salicylic acid, rarely.

Valentin, for exposing simulation of unilateral deafness, recommends the following procedure. He introduces tubes into both ears and brings a watch or a tuning-fork close to the end of the tube placed into the deaf ear behind the back of the patient, whereupon the malingerer will assert not to hear. The mouth of the second tube is then gradually brought nearer to the watch. In case of real deafness the person to be examined shall now hear at a distance of several inches.

3. KIESSELBACH in a preliminary communication reports the successful treatment of tinnitus and vertigo by means of injections with cocain. muriat. into the middle ear (per tubam). Every three to five days five to ten drops of a four-per-cent. solution were injected, which was gradually increased to ten per cent. In fresh cases Kiesselbach effected an immediate recovery by means of a single injection. He explains the effect through decrease of the arterial pressure by medium doses of cocaine.

INSTRUMENTS AND METHODS OF EXAMINATION.

4. L. LICHTWITZ, Bordeaux. The use of the new Edison's phonograph as general acoumeter. *Prager med. Wochenschr.*, 1889, No. 47.

5. C. KATZ, Berlin. Artificial drum membrane made of celloidine. *Deutsche med. Wochenschr.*, 1889, No. 28.

4. LICHTWITZ discusses the requirements of the acoumeter for the voice, and holds that they are for the most part fulfilled by Edison's phonograph, which is thought to represent a constant source of sound. This seems, however, not to be the case, for whenever the apparatus is set for the reproduction of spoken words from the same tube, different intensities are caused, since the connection does not always take place in exactly the same manner. The author's views are based merely upon theoretical considerations without experiments of his own with the phonograph.

5. KATZ recommends an artificial drum membrane made of celloidine. The prescription is as follows : pour into a flat watch-

glass about 1½ millimetres above its floor a solution of celloidine (celloidine 10.0, spiritus absol. and æther āā 50.0) and let it evaporate. A completely transparent, light, extremely thin, and elastic disc remains, from which the artificial drum membrane can be made. A cotton pellet, imbued on one end with the solution of celloidine, may be firmly attached to the centre. These drum membranes may be preserved in a forty per cent. solution of alcohol.

EXTERNAL EAR.

6. ANTON WILH. and LZENES LIGISM, Budapest. Some remarks upon the treatment of otitis externa circumscripta. Furunculosis. *Prager med. Wochenschr.*, 1889, No. 33.

7. KESSEL, Prof. Jena. Exostoses of the external meatus. *Corresp.-Blätter des allgem. ärztlichen Vereins in Thüringen*, 1889, No. 7.

8. KRAUS (Rzeschow). Annual report of the surgical department of Dr. Jablowski, surgeon-in-chief. *Przeglad lekarski*, 1889, No. 36.

6. ANTON and LZENES report their experiments upon the treatment of aural furuncles with menthol oil. They resulted in the fact that menthol cannot retard the formation of furuncles, prevent relapses, and cut short the course of the affection. Menthol relieves the pain in many instances, but its burning action is frequently too prominent.

7. KESSEL gives a full description of the exostoses and reports five cases operated by himself. He uses hollow but also wedge-shaped chisels, those with slanting edges and checking devices. The latter are used when the bone to be removed is extremely thin and the drum membrane very close to it. Then he uses the angular chisel instead of the straight one, which permits a better survey of the field of operation.

8. From Kraus' report the following case is worthy of mention. A cherry-stone was in an infant wedged in the bottom of the external meatus. All well-known methods of mechanical extraction were of no avail. The cartilaginous portion of the external meatus was detached under anæsthesia and the foreign body was removed by means of Daviel's spoon. SREBERNY (Warsaw).

MIDDLE EAR.

9. EICHBAUM, W. The importance of perforations of the drum membrane for recruitment. *Deutsche militärärztl. Zeitschr.*, 1889, No. 12.

10. GOMPERZ, B. Three cases of spontaneous shrinking of aural polypi. *Monatsschr. f. Ohrenheilk.*, etc., 1889, No. 7.

11. LEVY, M. Primary external osteoperiostitis of the mastoid process, and primary purulent inflammation of the mastoid cells. *Gazette hebdom. de medic. et de chirurg.*, 1889.

12. JACOBY, L., Breslau. Clinical contributions to the operative treatment of caries of the temporal bone (22 chisel operations in 20 patients). *Arch. f. Ohrenheilk.*, vols. xxviii. and xxix.

13. COLLER, New York. Thirteen cases of chronic purulent otitis media treated by excision of the ossicles, with remarks. *Deutsche med. Wochenschr.*, 1889, No. 28.

14. KOEBEL, Stuttgart. Case of caries of the tympanic and mastoid cavities. *Med. Correspond.-Blatt. von Württemberg*, 1889.

15. E. WEIL, Stuttgart. A case of necrosis of the labyrinth. *Med. Corresp.-Blatt. von Württemberg*, 1889.

16. KOERNER, OTTO, Frankfort-on-Maine. Statistical contributions to the knowledge of the cerebral abscess consequent upon aural disease. *Arch. f. Ohrenheilk.*, vol. xxix., p. 15.

9. The present ordination: "Grave aural affections, which are difficult to cure, unfit for military service," gives full play to the physician. Eichbaum, for the critical examination of perforations of drum membrane, lays down the following maxims: 1. Acute perforative purulent otitis media ought to be treated from two to three weeks. In case of no marked improvement or recovery: dismissal. Perforations of Shrapnell's membrane with simultaneous existence of a dyscrasia are excepted; in these cases immediate discharge. 2. In chronic suppurations of the middle ear, immediate discharge. 3. In dry perforations the persons examined may be taken into service if the perforation is not too large, if it is not in Shrapnell's membrane, if no granulations or polypi are present, if no chronic naso-pharyngeal catarrh and no dyscrasia (except syphilis) exist.

10. GOMPERZ reports three cases of spontaneous shrinking of aural polypi; his treatment consisted only in cleaning and air-douche. In two cases portions of the shrinking polypi were removed and subjected to histological examination, the sections being illustrated. From his observations, Gomperz infers that "the possibility of spontaneous shrinking of genuine polypi—tumors lined with epithelium—and also of pedunculated polypi is undeniable." He believes to be justified in recommending, if

no caries, no retention of pus, or no other aggravating symptoms are present, not at once to resort to the snare, but for several days to await the effect of the treatment, consisting only of air-douche, irrigation, and disinfection.

11. Levy gives two full histories of cases of primary external periostitis of the mastoid process, and of primary purulent inflammation of the mastoid cells. The abscess of the first case was incised, the opening was irrigated, and the wound covered with a cataplasm. On account of this obsolete treatment, additional suppurative inflammation set in, so as to necessitate a radical operation under anæsthesia. In the second case, the mastoid exhibited slight symptoms, whilst the tympanic cavity was healthy, as stated by an exploratory puncture. Whilst the pain persisted, facial paralysis with hemiplegia set in, discharge of sanguinolent fluid from the external meatus, and exitus letalis in an hour. Autopsy was not permitted.

12. Jacoby reports twenty histories of cases of operation of caries of the temporal bone. He believes that his communicated histories may certainly serve as guides, how in similar cases we may go to work, and how we should not. We learn from them that: (1) Irrigations under pressure are to be rejected, because of the production of facial paralysis (Case 1) and of exitus letalis (Case 2); (2) that irrigations through the tubes, during the last stage of an acute otitis, may cause inflammations of the mastoid process (Cases 3 and 4), and are, therefore, also to be rejected; and (3) that for chiselling of the mastoid an exact knowledge of the anatomical relations is necessary (Case 4).

13. Coller reports thirteen cases of excision of the ossicles. Full anæsthesia is necessary. The remnants of the drum membrane are removed with a trowel-shaped knife. The incudo-stapedial joint is cut through with a knife bent at an angle, and the malleus and incus are removed with a forceps after the severance of the adhesions. Eight cases recovered, five improved. The hearing faculty is in most cases considerably improved. The subjective symptoms, headache, tinnitus, etc., frequently disappear.

14. Scarlatinous otorrhœa of old standing, intense pain in the diseased ear for three weeks. Facial paralysis, marked signs of retention. Cutis of the mastoid process not materially changed. Chiselling. Extensive caries is found; the tympanum and antrum have become one cavity, of the size of a walnut. On the sixth day after the operation, death from pyæmia. The post-

mortem examination revealed perforation of the pus into the cerebral cavity at two places—first, into the middle cerebral fossa; secondly, into the transverse sinus,—which was followed by sinus phlebitis and thrombosis.

15. A boy, four years of age, was seized a year ago by pertussis, and suffered since that time from otorrhœa. Nine months ago abscess behind the ear, which healed after the elimination of a small sequestrum. Facial paralysis for six months; otorrhœa persisted. WEIL detected at the bottom of the external meatus a sequestrum, which after extraction was recognized as the greater part of the cochlea, the vestibulum, the outer lower semicircular canal, and portions of the other two.

16. KOERNER has collated one hundred cases of cerebral abscess from aural disease, and arrives at the following results. In 62 cases the abscesses were found in the cerebrum, in 32 in the cerebellum, in 6 in the cerebrum and the cerebellum. In children under ten years of age the cerebellar abscesses are comparatively less frequent. The disease is twice as frequent in the male as in the female sex. The brain abscesses are more frequent on the right side than on the left. With reference to the transmission of the affection from the temporal bone to the brain, Koerner comes to the conclusion that, in opposition to prevalent views, a considerable number of the brain abscesses developing in the course of an otorrhœa occur close to the primary affection, and are quite frequently, as it can be proven, continuous with the same. "Aural brain abscesses are principally found in those affections of the petrous and mastoid portions, which reach the dura mater, and they are located in the cerebrum in 64.8 per cent., in the cerebellum in 73.3, and in the cerebrum and cerebellum combined in 83.3 per cent. of the cases." Dura mater and brain substance between the destroyed bones and the brain abscess are frequently affected; in a considerable number (in twenty among ninety cases) existed a more or less wide connection between the deposits of pus in the bone and in the brain." With reference to the seat of the abscess, it is proven that brain abscesses transmitted from a diseased temporal bone are located in the adjoining parts of the cerebrum, viz., in the temporal lobe or in the cerebellum of the corresponding side.

NERVOUS APPARATUS.

17. MARINA, ALLESSANDRO R. Contribution to the symptomatology of tabes dorsalis, with special reference to the ear, larynx, and pharynx. *Arch. of Psych.*, vol. xxi., No. 1.

18. WINTERNITZ, LUDWIG, Vienna. A case of sudden deafness, with recovery. *Monatsschr. f. Ohrenheilk.*, etc., 1889, No. 11.

17. MARINA describes the symptoms arising from the ear, larynx, and pharynx in forty cases of tabes dorsalis. The aural examinations were made by Morpurgo, and the complete histories and the results of examinations were communicated. Seven cases (17.5 per cent.) among the forty had normal hearing, fifteen (37.5 per cent.) showed sure signs of bilateral affection of the inner ear, ten (25 per cent.) uncertain signs of uni- or bi-lateral affection of the inner ear, five cases were combined affections (middle and inner ear), and four cases were confined to the middle ear. The diagnosis of an affection of the middle or inner ear was made by means of Rinné's experiment. The pitch used for examination was, I regret to say, in most cases not stated, nor the time of hearing, which resulted from it; besides, the relation between the faculty of perception of high and low notes was not sufficiently taken into consideration. The diagnosis of disease of the inner ear suggests the unintentional idea of an affection of the labyrinth. The author believes, in spite of this diagnosis, to be justified in assuming "that in some cases not only the end apparatus, but also the acoustic nerve is implicated, principally in those cases in which the function is greatly impaired. Ménière's disease was not observed in any of the patients; neither subjective noises nor hardness of hearing were complained of by the patients. The hearing troubles in tabes may occur in every stage. Eight among eleven patients exhibited a more or less marked hyperexcitability of the acoustic nerve for electric irritations.

18. The case reported by WINTERNITZ showed unilateral deafness, which appeared suddenly with vertigo without objective changes at the hearing organ. Recovery under application of the constant current.

NOSE AND NASO-PHARYNX.

19. ZWAARDEMAKER, H., Utrecht. Cocainization of the nasa cavity and of the cavum pharyngo-nasale. *Arch. f. Ohrenheilk.* vol. xxix., p. 12.

20. SUCHANNEK, H. Zurich. Contribution to the after-treatment in operations in the nasal cavity. *Therap. Monatshefte*, 1889, No. 2.

21. SCHNEIDER. Some cases of cured nasal reflex epilepsy. *Berliner klin. Wochenschr.*, 1889, No. 43.

22. ZIEM, Danzig. Intra-ocular affections in nasal troubles. *Berliner klin. Wochenschr.*, 1889, No. 38.

23. BRONNER, ADOLF. Some relations between the diseases of the nose and the eye. *Journal of Laryngology and Rhinology*, December, 1889.

24. ROTHHOLZ, Stettin. Habitual epistaxis. *Deutsche med. Wochenschr.*, 1889, No. 40.

25. POTIQUET. The form of the nose in genuine ozæna or rhinitis atrophicans fœtida (sur la forme du nez dans l'ozène vraie ou rhinite atrophiante fétide). *Revue mens. de laryng., d'otol.*, etc.

26. SCHUBERT, PAUL, Nuremberg. Fungi in the nose. *Berliner klin. Wochenschr.*, 1889, No. 32.

27. BAUMGARTEN, Budapest. Rhino-surgical communications. *Ibid.*, 1889, Nos. 51 and 52.

28. GERBER. Contributions to the knowledge of the pharyngo-nasal syphilitic affections.

29. BRAUN. Extreme stuttering, hardness of hearing, and intense headache with incapacity of concentrating the attention for a longer period to an object (aprosexia, Guye). Cured by destruction of adenoid vegetations in the naso-pharynx. *Wiener klin. Wochenschr.*, 1889, No. 46.

30. MÜLLER, Berlin. Hysterical paralysis of the velum palatinum. *Charité-Annalen*, vol. xiv., p. 247.

31. Prof. ZAUFAL. Demonstration of a naso-pharyngeal-polypus. *Prager med. Wochenschr.*. 1889, No. 30.

32. KAFEMANN, Koenigsberg. Electrolytic treatment of chronic pharyngeal catarrh. *Deutsche med. Zeitung*, 1889, No. 70.

19. ZWAARDEMAKER recommends for cocainization of the naso-pharyngeal cavity an insufflator, consisting of a glass tube, through which the cocaine is applied as a powder.

20. SUCHANNEK describes an extremely minute method for the purpose of protecting the wounds against infection. It consists principally of partial plugging the nose with a 50-per-cent. iodoformized gauze, which is left for 3 to 4 days after operation with the cold snare, and for a week after cauterizations. If it cannot be borne, brushing with iodoform collodium is used in its place. After the removal of the plugging ½-per-cent. solutions of iodide of potassium in glycerine are locally applied for a few days.

21. SCHNEIDER has in five years observed six cases of reflex epilepsy of the nose, in which delusions are to be excluded. Several patients had considerable hypertrophies of the turbinated bodies, which partially caused asthmatic troubles. Their removal with Sommerbrodt's spiral burner was a marked success in every case. The same treatment, however, was without avail in a seventh case. The interesting histories are recommended by the reviewer for perusal in the original.

22. ZIEM holds that disturbances of the circulation within the eye are frequently caused by homologous troubles of the nose and its accessory cavities, and that in such cases it is indicated to institute proper treatment of the nasal affection. The author details as proof the histories of seven patients, who suffered from contraction of the field of vision and the range of accommodation, anomalies of refraction, subjective increase of tension of the globe, and similar symptoms. Simple nasal irrigations, principally irrigations through Highmore's antrum, resulted in material improvement of those phenomena.

23. BRONNER discusses the relations between ophthalmic and aural affections, and reports two cases in which treatment of the nasal affection cured the affection of the eye.

24. ROTHHOLZ, in accordance with other authors, has found the seat of the bleeding almost invariably upon the cartilaginous septum, and here upon its anterior portion, where it adjoins the septum mobile. In the paper, which is intended for the general practitioner, the author mentions a case of ulcus septi nasi perforans (Voltolini). In a young man, aged sixteen, with habitual epistaxis, "there was found at the typical place on the left side a marked loosening of the mucous membrane of roundish form, of about 1 *cm.* in diameter, slightly bleeding on probing; the corresponding place of the right side was normal." After cauterization with chromic acid the bleedings ceased. After two months, the author noticed at the same place a roundish perforation of the size of a ten-cent piece. The patients had not complained of any thing. A whitish coloring of the epithelium at the diseased place, as is described by Rossbach, could not be found; the author, however, thinks it to be characteristic of the ulcus perforans, that the perforation cannot be retarded, and that it does not increase or extend. There is no relation with syphilis.

25. POTIQUET, from his observations made in twenty-three ozæna patients, believes that the flat nose is not conducive of

ozæna. The flat and saddle nose owe most frequently their origin to a preceding rhinitis atrophicans. Adult ozæna patients have not the form of the nose which they ought to have inherited. The formation of the nose of ozæna patients is not in harmony with that of the skull. It depends upon the heredity, duration, and intensity of the affection, and also upon the time of its beginning.

26. The patient with bilateral nasal obstruction and offensive discharge was permanently cured by simple syringing and some insufflations of boric acid. The grayish-green and hardly soluble contents proved microscopically to be a fungus, which had beyond doubt grown as a saprophyt in the nasal secretions, since the mucous membrane of the nose was completely normal after removal, and no relapse occurred in spite of the mild treatment. Examination made by competent authority (Ferd. Cohn) confirmed the resemblance of this fungus, observed for the first time in the nose, with some others, which cause great ravages as parasites among the insects (silk-worm, gastropacha pini), but excluded its identity with aspergillus and mucor.

27. BAUMGARTEN describes: 1. A case of rhinolithiasis in a woman, æt. fifty-four, which was associated with nasal obstruction for ten years, continuous pain in the zygomatic and temporal regions and offensive discharge. One of the removed concretions contained two grape-stones. 2. Perforation of the nasal septum by diphtheria. Ulceration with perforation of the size of a lentil. 3. Membranous occlusion of the choanæ associated with adenoid vegetations, cured by galvano-cautery. 4. Two cases of rhinitis and rhinopharyngitis fibrinosa, which developed in the first case after the use of the galvano-cautery and in the second case spontaneously. Cured by iodine glycerine solution. 5. Gumma of the nose and naso-pharynx. Cured by mercury and iodide of potassium.

28. GERBER gives a series of twenty-seven detailed histories of early tertiary syphilitic affections of the nose, naso-pharynx, and mouth. He arrives at the following conclusions: It is immaterial whether treatment with mercury has taken place or not; the greatest danger of a relapse exists from the first to the third year and from the eighth to the fourteenth year *post infectionem*. Furrow-shaped ulcers of the septum taking a sagittal direction are a valuable aid for the diagnosis of nasal and naso-pharyngeal syphilis; the odor is not pathognomonic. In syphilis of the naso-

pharynx rhinoscopia posterior is indispensable, since marked symptoms might be absent in the mouth, pharynx, and nose, as Case 15 clearly demonstrates. The prognosis is favorable, even after the duration of the syphilitic affection for several months, under suitable specific local and general treatment. The atrophy which develops in consequence of the affection cannot be cured.

29. College pupil, æt. fifteen, is affected with the anomalies mentioned in the heading. The affection began six years ago and grew gradually worse. The naso-pharyngeal cavity was completely filled with adenoid vegetations, the choanæ and mouths of the Eustachian tubes being occluded. The vegetations were removed in twenty sittings with the galvano-cautery under the guidance of the mirror, and thus all symptoms were relieved. Even the stuttering had almost entirely disappeared after the eighth sitting.

30. In a girl, æt. eighteen, who had suffered two years previously from "diphtheria," paralysis had followed an angina. The speech had a nasal twang; in pronouncing the A (ā as in fāther) the velum rose slightly. Patient never got any food into the wrong passages during swallowing; the sensibility was greatly diminished. Besides these two signs the diagnosis of hysteria was supported by the absence of other paralytic symptoms, but principally, after a cure had been effected in a few days by slight faradization, by the development of a relapse, associated with aphonia, after four weeks, in consequence of a strong emotion, which was cured by strong faradic currents in one sitting.

31. ZAUFAL, at the summer meeting of German physicians of Bohemia, demonstrated a naso-pharyngeal polypus, which, according to his opinion, was the largest of those described heretofore. It weighed 112 grammes, and was 11 centim. long, 6 centim. wide, and had 14 centim. in circumference. The patient had first troubles in speaking seventeen years previously, but difficulty in swallowing not before the last two weeks. The lower extremity of the tumor reached the entrance of the larynx, one process filling the left lower meatus. The finger introduced into the mouth could feel around the tumor up toward the left choana. It was removed by first raising its lower part into the mouth, grasping it with both hands and then pulling it out by a strong pull. On the sixth day after the operation intense bleeding, which was stopped by plugging with Belloc's canula, followed by bilateral purulent otitis media. Recovery in four weeks with normal hearing power.

32. KAFEMANN attributes *a priori* great value to electrolysis and emphasizes its real, not theoretical, effects. The electrodes, of which three different ones are illustrated, are attached to a handle and thrust into the follicles or lateral thickenings. In the former the action of not too strong a current lasting a few seconds is sufficient. In the latter, thirty to sixty seconds, or eventual repeated applications, are needed. The advantages of the treatment over the galvano-cautery are, according to Kafemann, as follows : It is carried out without danger, it is easy of access, also for the inexperienced practitioner, and there is much less inflammatory reaction connected with it.

BRITISH OTOLOGICAL NOTES.

APPOINTMENTS.

EDINBURGH ROYAL INFIRMARY.—Dr. Mackenzie Johnston has been appointed Assistant to Dr. McBride in the Throat and Ear Department.

CENTRAL LONDON THROAT AND EAR HOSPITAL.—V. Wyatt Wingrave, M.R.C.S., L.R.C.P., has been appointed Registrar and Anæsthetist.

WALTER FOWLER, F.R.C.S., etc., has been appointed Assistant Surgeon.

BIRKENHEAD EYE AND EAR HOSPITAL.—Wallace Q. MacAdam, M.B., C.M., has been appointed Honorary Surgeon.

ABERDEEN INFIRMARY.—Dr. Mackenzie Booth, Lecturer on Diseases of the Ear and Larynx to the University, has been appointed Assistant Visiting Surgeon.

ST. MARK'S OPHTHALMIC AND AURAL HOSPITAL, DUBLIN.—W. R. Graves, L.K.Q.C.P., L.R.C.S.I., has been appointed Pathologist.

EDUCATION OF THE DEAF AND DUMB.

The Pure Oral Institution held a festival at the Hôtel Métropole on May 12th, and at the end of the same month the annual meeting of the Ealing College Training School for teachers by the same method was held, by the kind permission of the Bishop of London, at Lambeth Palace.

We are pleased to be able to announce that the bill providing for the education of blind and deaf-mute children in Scotland, having passed through all its parliamentary stages, has received Her Majesty's consent, and has therefore now become law.

ORAL TEACHING OF THE DEAF AND DUMB.—A meeting of the supporters of this institution was held in the Steinway Hall, Lon-

don, on July 22d. Lord Granville presided, and the Countess of Roseberry distributed the prizes which had been awarded to the successful students during the preceding term. From the report, which was read at the meeting, it appears that thirty-four boys and nineteen girls have attended the classes during the last year, and ten students have been received into the teachers' training college. It was incidentally mentioned that the demand for teachers exceeds the supply.

The recent agitation in England on behalf of the deaf and dumb appears to be extending to its colonies. News reaches us from India that a wealthy native (Babra Girindra Nath Bose) has offered to give 1,000 rupees (about £80) towards the cost of erecting an educational establishment for the deaf at Calcutta, and a further sum of 2,400 rupees (about £200) annually for three years towards the endowment. The building of the institution may therefore almost be considered *un fait accompli*, for it is more than probable that the Imperial Government will guarantee the remainder of the money.

At a representative meeting of the deaf and dumb, held at Leeds on July 24th, it was resolved to form "A NATIONAL DEAF AND DUMB ASSOCIATION," and rules were adopted and officers appointed. The objects of the Association were stated to be "to protect the interests, elevate the social status, and secure higher education for the deaf and dumb." We cordially wish the new combination every success.

A new Italian journal, to be issued monthly, and entitled *Il Sordomuto*, has been started by Dr. G. Longhi, founder of the Orotherapeutic Institute of Milan.

MISCELLANEOUS.

The schemes arranged for the Post-Graduate Courses at Edinburgh and Glasgow respectively appear to be very complete. At the former Mr. Reginald Horsley lectured and demonstrated upon diseases of the ear and throat at the New Town Dispensary, while at Glasgow diseases of the ear are treated by Drs. Barr and Macfie. With these examples before them, it is to be hoped that the managers of the London Post-Graduate courses may, in future, be induced to add "Diseases of the Ear" to their list; we feel convinced that there are few subjects which would be more highly appreciated.

Arrangements are being made for the erection of additional

buildings in connection with the Royal Infirmary at Edinburgh. By this means it is hoped to be able to set aside special wards for the reception of ear, throat, and skin cases.

The foundation stone has been laid in Birmingham of a new Ear and Throat Hospital which promises to be a noteworthy addition to the charitable institutions of that city. Accommodation for twenty in-patients is to be provided, as well as for a large out-patient department.

The recent annual report of the Glasgow Ear Hospital shows a steady increase in the number of cases treated, and since the publication of the last report, considerable improvement has been made in the service of the hospital. A ward containing six beds has been started, and an operating room fitted up; fifty-six patients have thus been enabled to obtain the advantages of indoor-treatment.

By the death of G. N. Clark, Esq., L.S.A., L.R.C.P., an old Newcastle practitioner, the Northern Counties' Deaf and Dumb Asylum benefits to the extent of £500, and a similar sum has been left to the same institution by the late R. W. Hollin, Esq., formerly Lord Mayor of York.

The late Mr. Andrew Peckard has bequeathed the sum of £250 to the Leeds Institution for the Blind, Deaf, and Dumb.

The Yorkshire Institution for Deaf and Dumb Girls has received a bequest of £200 under the will of the late W. Aldam, Esq., of Tuckley Hall, Yorks.

Our contemporary, the *Lancet*, issues a timely warning on the promiscuous use of "ear drums." We cannot do better than quote the concluding paragraph of the article: "Certain much-vaunted drums are given, or, rather, sold, by quacks to patients suffering from all and every kind of deafness, to such an extent that nearly ninety per cent. of patients have another rigid drum placed upon a natural drum which is already too dense."

With this opinion probably all aural surgeons will be disposed to agree; it becomes a serious consideration, therefore, for them not only to discountenance the abuse, but to take care that they do not, by the indiscriminate advocacy of the claims of their own inventions, lead to the encouragement of the mischief which, on the contrary, it should be their aim to minimize.

In the *Australian Medical Gazette*, of July, Dr. W. Quaife publishes particulars of an interesting case of deafness associated with congenital syphilis.

SOCIETY MEETINGS.—At a meeting of the Lancashire and Cheshire Branch of the British Medical Association, held at Owens College, Manchester, on July 2d, Mr. Milligan read a paper upon "The choice of a Caustic in the Treatment of Granulations of the Middle Ear," and Dr. Larmuth showed some interesting cases of ear disease.

BRITISH MEDICAL ASSOCIATION.—The annual meeting of this association was held in Birmingham from July 29th to August 1st, 1890. In the section of Otology, Dr. Charles Warden presided and delivered an able and interesting address upon "Specialism and Specialists."

The meetings of the section were well attended, and many of the papers read gave rise to considerable discussion. We hope to be able to refer in detail to these papers on a future occasion, and will therefore content ourselves at present with a bare enumeration.

Mr. Arbuthnot Lane advocated the more frequent performance of mastoid trephining in his paper on Chronic Suppurative Catarrh of the Middle Ear.

Mr. W. H. Stewart, on the Treatment of Chronic Suppuration of the Middle Ear, spoke against indiscriminate syringing in unskilled hands, preferring irrigation with the intra-tympanic douche.

Dr. Donald Stewart read a paper on the Comparative Advantages of the Eustachian Catheter and Politzer's Bag for Inflation of the Middle Ear.

A discussion on Intra-nasal Disease in Relation to Aural Affections was introduced by Mr. L. Brown, Mr. Macnaughten Jones initiating the discussion on the Etiology of Tinnitus.

Dr. Barr read a paper on the Injurious Effects of Loud Sounds upon the Hearing, with Special Reference to Railway Whistles. Demonstrations illustrative of the value of artificial drumheads were carried out by Dr. Ward Cousins.

Dr. A. Bronner read a paper on the Importance of Detecting and Treating Diseases of the Ear and Post-Nasal Growths in the Children of our Board Schools.

Reviews.

Pathology and Therapeutics of Mouth-Breathing. By Dr. EMIL BLOCH. Wiesbaden : J. F. Bergmann. 1889. Reviewed by Prof. S. Moos.

The author, who has already published in these ARCHIVES his studies on the physiology of mouth-breathing, makes in the work now lying before us "the first attempt to look at a time-worn topic from a new aspect." With these words he introduces himself to the reader, and hopes that investigation will show that the attempt has been useful. At all events any one who has so thoroughly studied his subject as has the author has a certain right to illuminate it from the standpoint of physiology. For this purpose he seems to have had a large experience, and to have zealously collected his own observations, to say nothing of an exhaustive bibliography of the subject appended to the work. For these reasons alone the book is worthy of great merit, and chiefly because we here find in a nutshell, as it were, every thing of importance and of use to the practitioner. And therapeutically the book actually gives us more than we had promised to us, and above all not only the etiology and the symptomatology but the hygienic aspect are brought well into the foreground.

The contents are as follows, by chapters :

I. Contrarespirator—II. Physiology of Nasal Breathing ; Comparison with Mouth-Breathing—III. Causation of Mouth-Breathing—IV. Mechanism of Mouth-Breathing—V. Symptoms and Sequences of Mouth-Breathing—VI. In this chapter we especially note what the author says in regard to the etiology of diphtheria, and in the relation of nose-breathing to enuresis nocturna—VII. Treatment of Mouth-Breathing.

We cannot at this time enter into details, and simply commend in the warmest fashion the book to our colleagues as both practical and useful.

The Corrosion-Anatomy of the Osseous Labyrinth of the Human Ear. Atlas of 10 plates, with text, in portfolio, $2.50. By Dr. FRIEDR. SIEBENMANN, Lecturer on Otology and Laryngology at the University of Bâle. J. F. Bergmann, Publisher, Wiesbaden, 1890. Reviewed by Prof. F. Bezold, Munich.

The cavities of the macerated temporal bone, brought to view by metal casts according to the corrosion method, are carefully described and superbly illustrated in this work. The technique to obtain such casts, the detailed description of which forms the introduction to the monograph, has been so much perfected by Siebenmann that the most delicate details come out with wonderful clearness and accuracy. It is to be hoped that this method will soon be generally used in studying and teaching otology.

Siebenmann confines himself to the morphology of the labyrinth and its surroundings, though his specimens present all the cavities of the temporal bone with equal perfection.

The cancellous bone substance enclosing the labyrinth, all the smaller and larger cavities, the two aqueducts, the vascular and nerve canals of the child as well as of the adult, are beautifully illustrated and clearly described. The reviewer feels exceedingly gratified by Dr. Siebenmann's excellent work, it being a continuation and supplement of his own "corrosion anatomy,"[1] which concerned only the middle ear. The youthful, intelligent, and painstaking investigator [Bezold's former pupil—ED.] has thus with admirable success relieved him of a difficult task which otherwise he would have thought incumbent upon himself.

[1] See these ARCHIVES, xiii., 79.